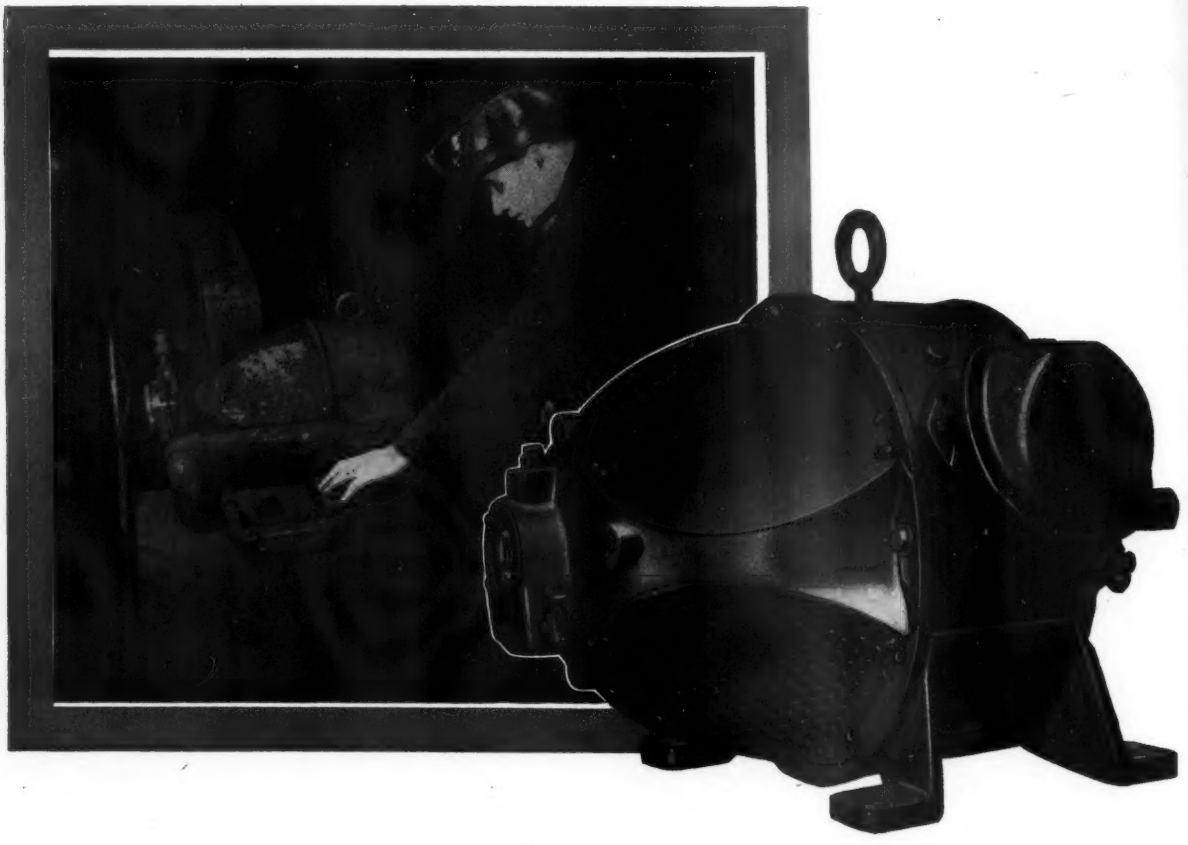
Mining CONGRESS JOURNAL

THE AMERICAN MINING CONGRESS

FEBRUARY 1945

Review AND Outlook FOR MINING



...twins born 32 years apart!

MORE WESTINGHOUSE SK MOTORS ARE USED IN COAL MINES TODAY THAN ALL OTHER MAKES COMBINED

AMPLE DESIGN—guts to carry the heavy loads—rigid one-piece frame with feet welded to frame to provide rigid integral foundation—uniform magnetic path aids commutation.

SPECIALLY DESIGNED INSULATION—field coils wound on rigid Micarta spool—vacuum-impregnated with hydrolene gum—eliminates air pockets. Mica-insulated armature coils—form-wound on all except the smaller ratings—protect against moisture or dust—prevent electrical breakdown.

EXCLUSIVE WESTINGHOUSE VESTIBULE SEAL—keeps lubricant in—dust and dirt out.

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WIDE RANGE OF RATINGS—from 1 to 200 hp to meet every mining requirement.

They may not look *exactly* alike, but the basic construction has never been changed—your SK Motor *never gets out of date,* for parts made today for the latest improved design will fit any SK Motor ever built of the same rating and frame. When you standardize on SK Motors, you automatically reduce maintenance problems and simplify replacement parts requirements—and you get performance which is unsurpassed for dependability. See your nearest Westinghouse representative, or write for Descriptive Bulletin 3500-1. Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

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Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

SK MINING MOTORS

Mining CONGRESS JOURNAL

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VOLUME 31, NUMBER 2 FOR FEBRUARY 1945

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FRONT COVER: Henry Martin, 81, for 40 years a prospector in the Cripple Creek area. He likes to work over old dumps; perhaps he'll spot something the other fellow missed.

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress.

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Member, Audit Bureau of Circulation.

GET THE Right WIRE ROPE

More and more, stripping operations have been making headlines in the coal industry. Small wonder, with mechanical monsters like this one on the job! His teeth bite deep, and the yardage he moves is tremendous.

But wire rope, too, has a vital bearing on the amount of useful work accomplished by a dragline machine. The longer its ropes stay in service, the less time it spends out of action.

That is why Bethlehem engineers have devoted particular effort to developing the proper ropes for dragline service. Such items as lay, core, abrasion-resistance, fatigue - resistance, and flexibility have been given intensive study. Naturally, the same sizes and constructions are not suitable for every rope on a dragline machine; but the important part is, Bethlehem makes it possible for you to get the *right* rope . . . whether it's for the drag line itself, or the hoist and boom lines.

When buying ropes for stripping machines, insist on Purple Strand (Bethlehem's best). And for those applications needing a highly flexible rope . . . such as your hoist line, for instance . . . make it Purple Strand Form-Set*.

**Form-Set means "preformed" in Bethlehem wire-rope language. And "preformed" means easy handling . . . bendability . . . longer life.*

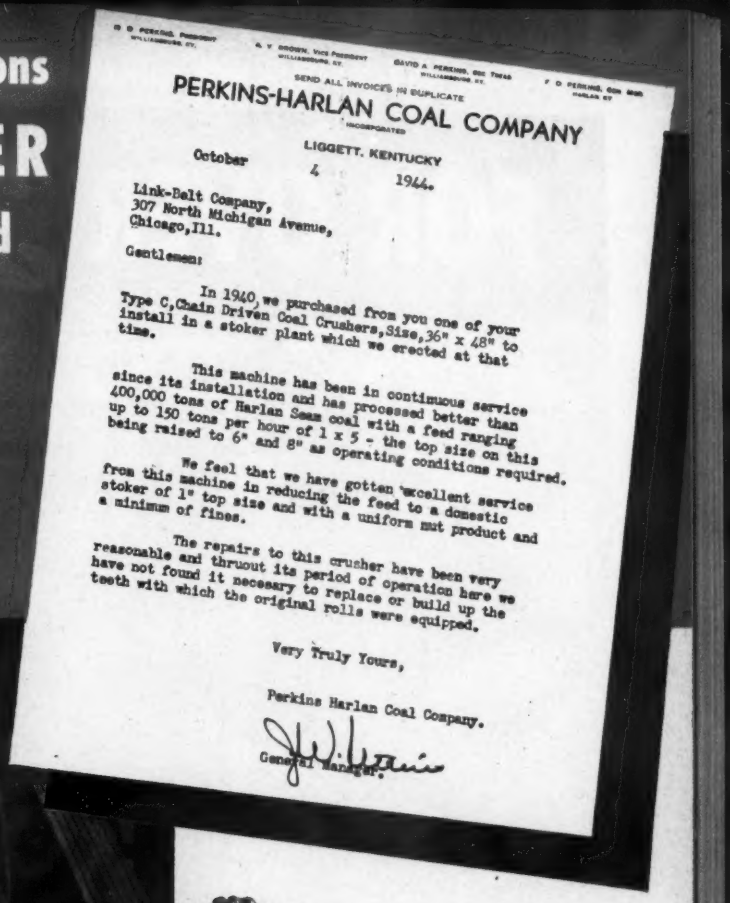
When you think WIRE ROPE
. . . think BETHLEHEM

After Processing 400,000 Tons

LINK-BELT 2-ROLL SIZER

Still Gives Maximum Yield of Stoker Sizes

In August, 1940, Perkins-Harlan Coal Co., Liggett, Kentucky, bought a Link-Belt Chain-Drive 2-Roll Sizer and has operated it 5 to 6 days a week, and at least 7 hours per day. As Mr. J. W. Adkins, Gen. Mgr., points out in this letter, the sizer is still delivering a very high yield of stoker coal. Neither teeth nor segments have been replaced.



SEND ALL INVOICES IN DUPLICATE

PERKINS-HARLAN COAL COMPANY
INCORPORATED

LIGGETT, KENTUCKY

October 4 1944.

Link-Belt Company,
307 North Michigan Avenue,
Chicago, Ill.

Gentlemen:

In 1940, we purchased from you one of your Type C, Chain Driven Coal Crushers, Size, 36" x 48" to install in a stoker plant which we erected at that time.

This machine has been in continuous service since its installation and has processed better than 400,000 tons of Harlan Seam coal with a feed ranging up to 150 tons per hour of 1 x 5 - the top size on this being raised to 6" and 8" as operating conditions required.

We feel that we have gotten excellent service from this machine in reducing the feed to a domestic stoker of 1" top size and with a uniform nut product and a minimum of fines.

The repairs to this crusher have been very reasonable and thruout its period of operation here we have not found it necessary to replace or build up the teeth with which the original rolls were equipped.

Very Truly Yours,

Perkins Harlan Coal Company.

General Manager.

WHY GREATER REALIZATION

1. Coal cracks with minimum fines.
2. Less degradation, less oversize—more premium size.
3. Proper tooth design and spacing.
4. Slow roll speed.
5. Quick, accurate changes of roll settings can be accomplished by push button control.
6. Simple, compact design saves space.
7. Unbreakable, all-welded steel frame.
8. Smooth, quiet operation.
9. Low maintenance cost.
10. Less power for driving.

MECHANICAL ROLL ADJUSTER

Gives Greater Flexibility. Saves Time—Increases Output. Where frequent adjustments of roll settings are required, considerable saving can be made with the Link-Belt mechanical roll adjuster which can be furnished. It is available in two types—power and hand operated. Let us tell you more about this feature of the Link-Belt 2-Roll Sizer.

Get in Touch with Nearest Link-Belt Office

The stoker-coal market will grow rapidly. You can obtain a larger share of this business, more profitably, with the Link-Belt chain-driven two-roll sizer. Investigate now. Many other operators have done so—have found this new method of sizing all they hoped for. Let us send you further information.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 19, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8, Vancouver

FOR OVER 30 YEARS

SEE *Safety Efficiency Economy*

with WHEAT

THE APPROVED CAP LAMP

Underground Safety Established
...WHEAT *Approved*
SHOT-FIRING DEVICE

For over 30 years safety, efficiency, and economy have been combined in the WHEAT approved electric cap lamp to make it the outstanding mine safety lamp.

For over 30 years WHEAT has helped to create greater coal productivity with safety — reduced fatalities per ton. Steadier, brighter light throughout the entire shift has helped to increase mine output over 20% per man day.

WHEAT electric cap lamps and batteries cost less, are more economical to operate. WHEAT Self Service System and the short time required for watering batteries insure marked savings in the lamp house operation.

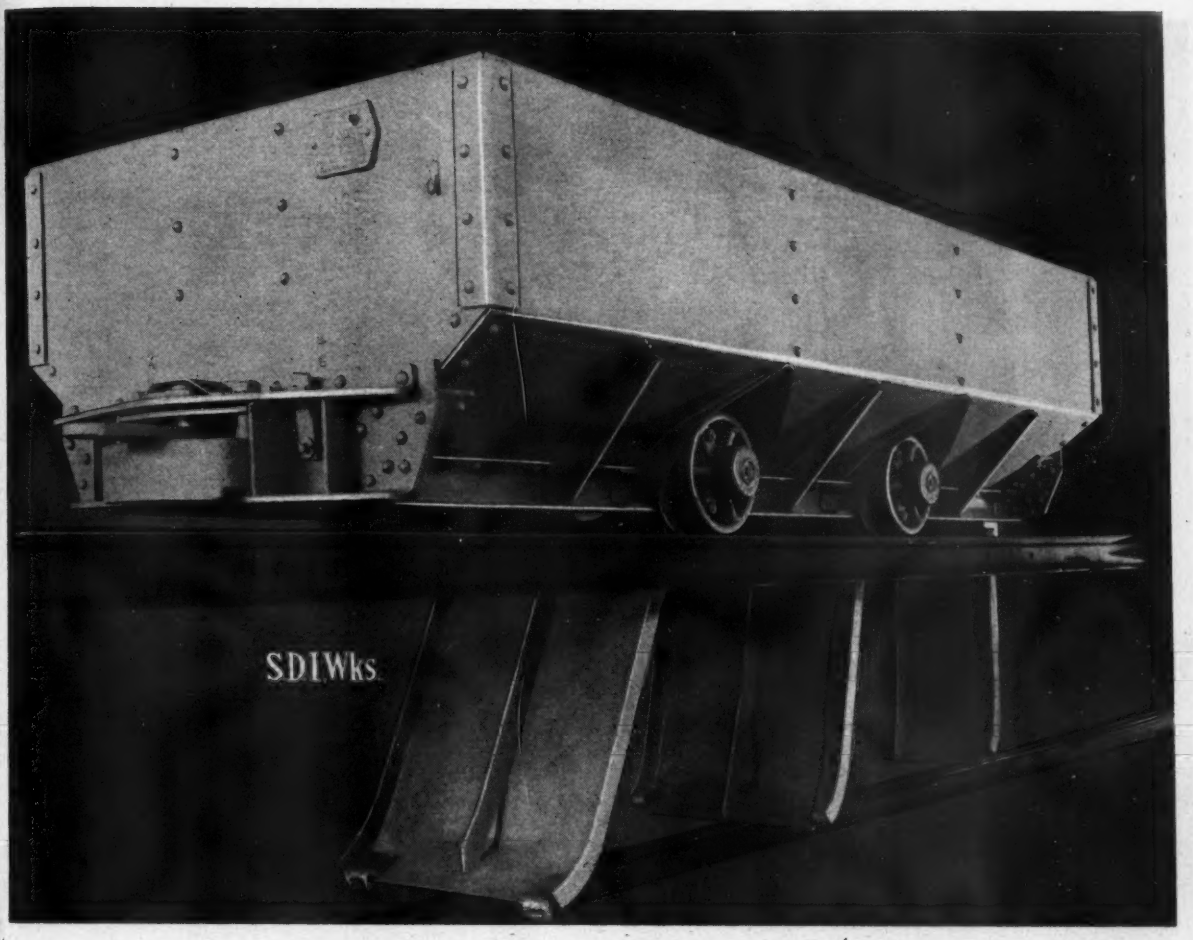
The results obtained in increased production with lower accident rate and lower cost per ton, will repay close study by those interested in cost-reduction and employee welfare.

SPECIALISTS IN MINE LIGHTING FOR 30 YEARS

KOEHLER MFG. CO.
Marlboro · · · Mass.

Eastern U. S. A.:
WHEAT LAMP SALES INC., Charleston, W. Va.
Western U. S. A.:
E. D. BULLARD CO., San Francisco, Cal.
Eastern Canada:
H. C. BURTON & Co., Hamilton, Ontario
British Columbia:
B. C. EQUIPMENT CO., LTD., Vancouver, B. C.

BETTER LIGHT - LESS WEIGHT
NON-SPILLABLE



WE LIFTED ITS FACE ON THE LATCH END

• *The S-D 1-2-3 "Automatic" pictured above has 12 ft. sides, is 5'6" wide, 3'4" high above rail, with a capacity approximating 4½ tons.*

• The photograph above shows one of our modern S-D 1-2-3 "Automatic" bottom discharge cars. The new latch end is shown and its face has been lifted . . . smoothed out, with all the conventional outside tripping mechanism eliminated from the car.

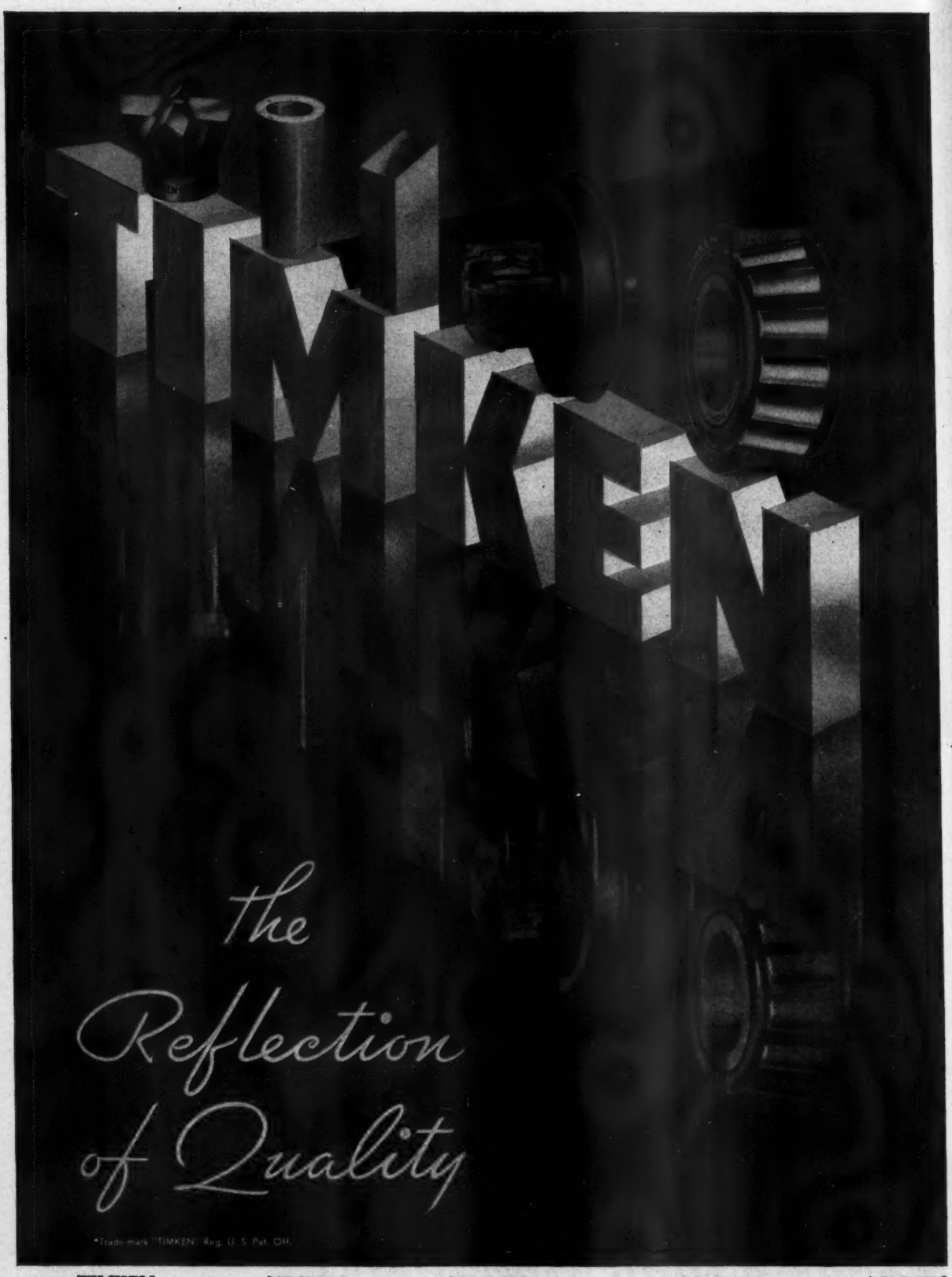
How has it been done? The new S-D Di-Dapper Nock-out mechanism is responsible. The old-fashioned latch lever arm which extended beyond the side of the car, and which had to be raised by hand or some mechanism alongside of the track, has been done away with. No protruding lever arms to be bent in collisions, etc. remain.

The Automatic Di-Dapper Nock-out mechanism, at the bin, unlatches two independently-operated catches from underneath the car. Two latch hooks are provided for maximum safety. A simple provision is made for hand tripping cars of slate or rock enroute to tipple.

In this new car we have achieved our goal—the coal mine's most perfect mine car. The goal includes, man-less dumping—foolproof operation—greatest possible capacity for any given over-all dimensions—elimination of needless dead weight—smooth running, long lasting trucks—saving in lubrication cost—saving in the cost of electricity used in haulage—maximum reduction in cost of maintaining cars—reduction of coal breakage to the minimum. All of these results have been accomplished by the persisting effort of the engineers of the Sanford-Day Iron Works.

Write us for complete details on these remarkable developments.

Sanford-Day Iron Works KNOXVILLE, TENNESSEE



TIMKEN Tapered Roller Bearings | **TIMKEN** Alloy Steels | **TIMKEN** Seamless Steel Tubing | **TIMKEN** Railway Roller Bearings | **TIMKEN** Rock Bits

IT'S THE TONNAGE THEY DELIVER THAT COUNTS

In Mine Locomotives and Shuttle Cars Alkaline Batteries Give You These Important Advantages

- They are **durable mechanically;** grids, containers and other structural parts of the cells are of steel; the alkaline electrolyte is a preservative of steel.
- They are **foolproof electrically;** are not injured by short circuiting, reverse charging or similar accidents.
- They can be **charged rapidly;** do not require critical adjustment of charge rates; can be charged directly from mine d-c supply.
- They **withstand temperature extremes;** are free from freezing hazard; are easily ventilated for rapid cooling.
- They can **stand idle indefinitely** without injury. Merely discharge, short-circuit, and store in a clean, dry place.
- They are **simple and easy to maintain.**

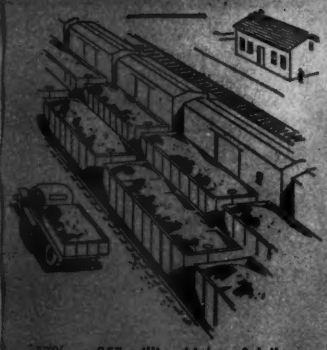
Keeping maximum production of coal or ore coming out puts a premium on availability of underground haulage and tramming equipment.

Time and experience have demonstrated that the unequaled dependability of Edison alkaline batteries gives the closest approach to failure-free, uninterrupted haulage it is possible to obtain. They stay on the job and out of the repair shop . . . give longer service life than any other type of battery. In fact, alkaline batteries that have been "worn out" in locomotive or shuttle-car service, are often used for various kinds of lighter duty standby work for which their capacity is still ample, and there deliver more years of dependable service.

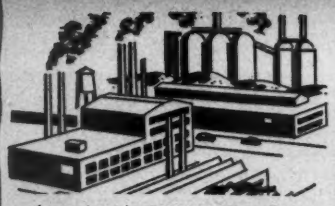
Because they give such long, trouble-free life and are so simple to maintain, alkaline batteries also help keep down haulage costs. *Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J.*

Edison
ALKALINE BATTERIES

9% or 135 million highway dollars will be invested in cement.



17% or 255 million highway dollars will be invested in transportation.



Approximately 14% or 210 million highway dollars will be invested in iron and steel, rubber, explosives and other manufactures including power.

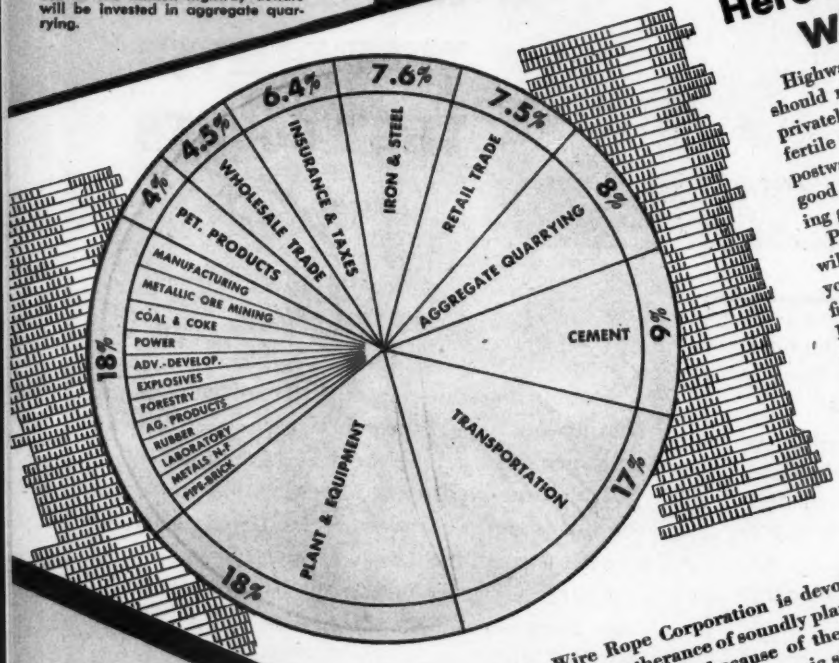
8% or 120 million highway dollars will be invested in aggregate quarrying.

Here's How Public Construction Will Help Your Business

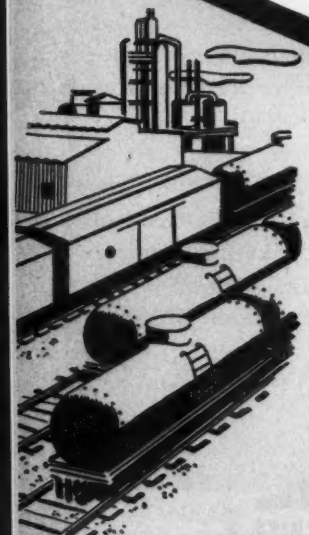
Highways, waterways and ground facilities for the airways should not, probably could not, be privately financed and privately operated for private profit. They are proper and fertile fields for the investment of public funds. No other postwar dollars can pay off so handsomely in millions of good jobs, in universal public benefits and in far reaching good business.

Probably the smartest and the busiest postwar dollars will be those spent for highways, roads and streets. How yours and twenty other branches of industry will benefit is shown on the chart. The studies of the U. S. Public Roads Administration, upon which it is based, also show that each dollar spent will result in business transactions totaling more than three dollars.

Every citizen has an interest in the postwar highway building and other public construction programs. Workmen and business men have a double interest worthy of extra attention.



Union Wire Rope Corporation is devoting current advertising funds to furtherance of soundly planned public construction programs because of their historic ability to function as economic stabilizers such as will be needed at war's end.

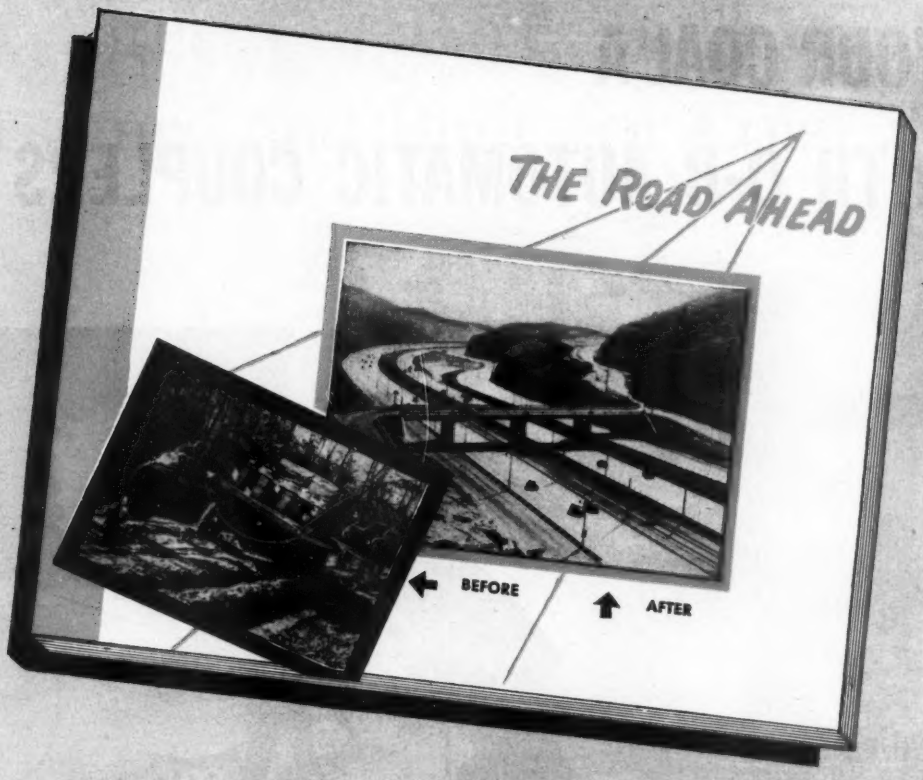


Approximately 12% or 180 million highway dollars will be invested in petroleum, metals, coal and other products of the mines, forests and farms.

In all these industries and on the highway projects labor will receive the major share of the total investment.

18% or 270 million highway dollars will be invested in plant and equipment.

14% or 210 million highway dollars will be invested with wholesalers and retailers—8% or 120 million will pay taxes, buy insurance, advertising and laboratory development.



Is Your State or City Prepared To Gain Modern Highways, Roads and Streets BY MATCHING DOLLARS?

Both Houses of Congress have approved, and the President has signed, bills calling for 1½ billion dollars to construct postwar highways, roads and streets. Although bigger than any highway appropriation of the past, this is modest in comparison with the need as shown by studies of the U. S. Public Roads Administration, State and County highway officials and American Road Builders' Assn.

In order to utilize Federal highway funds, each state or municipality must be prepared with its own matching funds. In many states revenue from highway levies have been inadequate. In others it has been used for other purposes. If, for any reason, your state or community is not prepared to match the Federal funds allocated, no doubt your state legislators will welcome active public support of a highway building program in the 1945 legislative session.

As an aid in organizing and offering intelligent support, may we suggest that you study carefully the book entitled "The Road Ahead". It has been impartially compiled and published by the American Road Builders' Association and is highly informative on all phases of the vital subject of highways, roads and streets. For a free copy send the coupon below to either of the addresses given.

UNION WIRE ROPE CORPORATION
2144 Manchester Ave.
Kansas City 3, Missouri

AMERICAN ROAD BUILDERS' ASSOCIATION
Mr. Charles M. Upham, Engineer-Director
1319 F St., N. W., Washington 4, D. C.

Send a Free copy of book entitled "The Road Ahead"

NAME _____

FIRM _____

ADDRESS _____ CITY _____ STATE _____

GIVE YOUR COAL A *SLEEPER RIDE*

WITH O-B AUTOMATIC COUPLERS

REDUCE SPILLAGE IN TRANSIT... KEEP TONNAGE ON THE CARS FROM FACE TO TIPPLE

2514AM

By Eliminating 15 to 20 Feet of *DEAD SLACK* per Trip, O-B Automatic Couplers....

...Reduce Car Bumping and Backlashing

....Keep Cars in a Smooth-Pulling Line

...Permit Faster Haulage Speeds

....Lessen Danger of Derailment

A MUST FOR MODERN MINE HAULAGE

Large Capacity Mine Cars Equipped with O-B Automatic Couplers

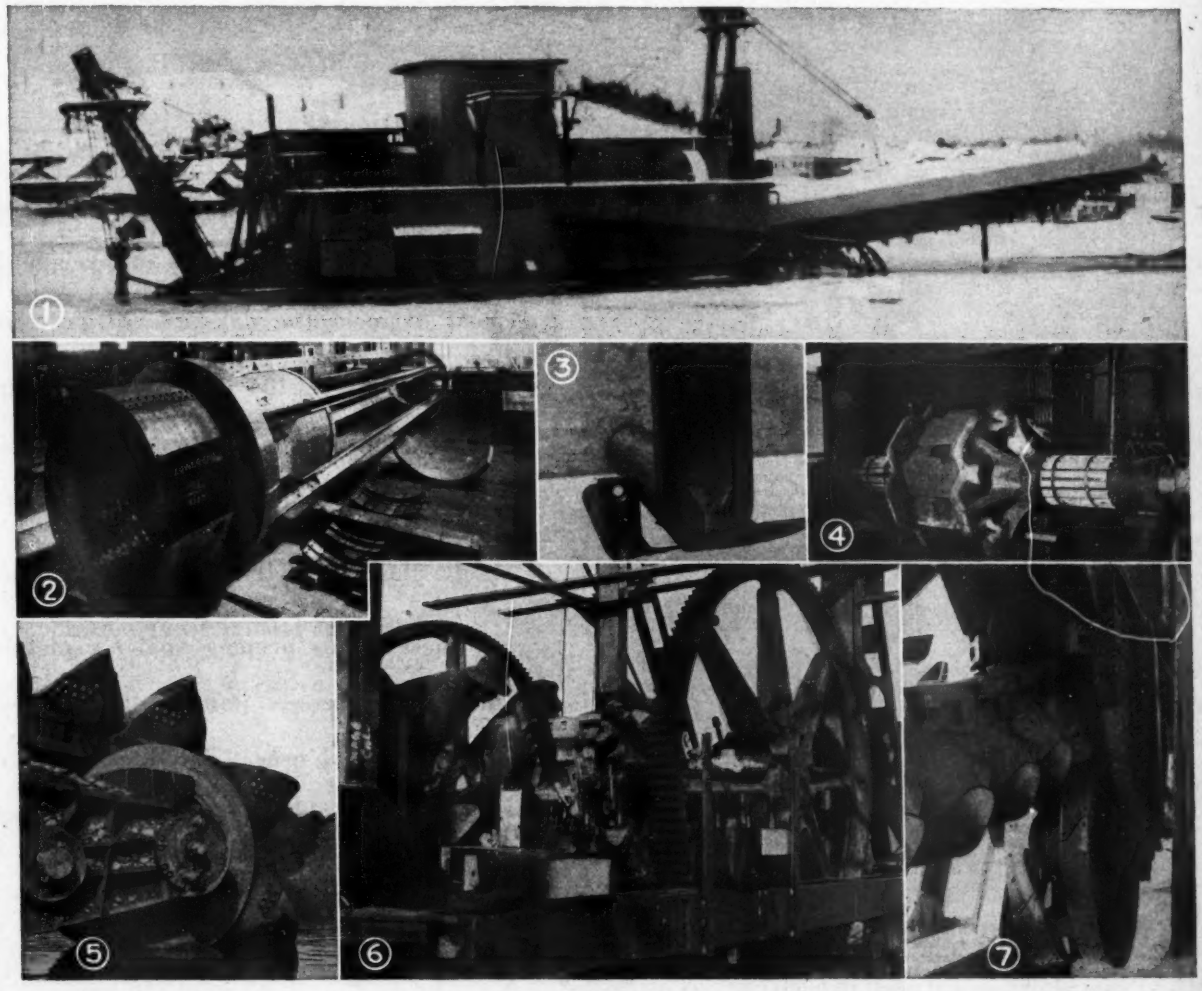
Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Ltd., Niagara Falls, Ont.

KEEP BUYING WAR BONDS

Dredges and Parts by YUBA Are Designed and Built for Long Service



A typical Yuba dredge and parts: (1) Dredge for platinum mining in Russia; (2) Revolving screen; (3) Bucket pins; (4) One piece upper tumbler; (5) Lower tumbler; (6) Bucket line drive; and (7) "Perry Patented" bucket idler.

Dredge parts by Yuba can be furnished now, subject to priority and allotment regulations. Let us know your needs and we will do our best to make shipments promptly.

YUBA MANUFACTURING CO.
351 California St., San Francisco 4, California, U. S. A.
AGENTS: Alluvial Dredges, Ltd., Renfrew, Scotland; London, England—Simo, Darby & Co., Ltd.
CABLES: Yubamon, San Francisco—Yardage, London

YUBA DREDGES
PROVED DEPENDABILITY ROUND THE WORLD

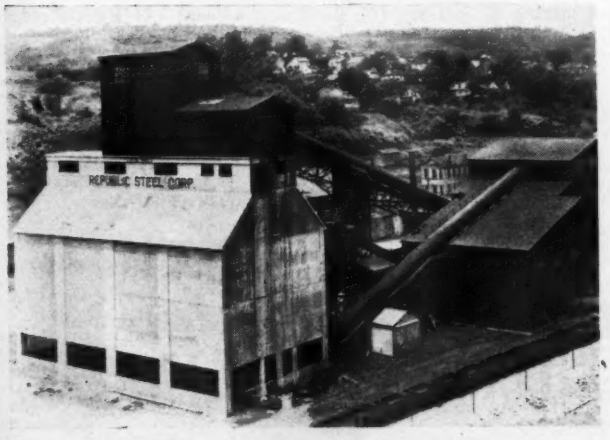
TOMORROW'S MARKETS *will* DEMAND prepared coal....

★ WARWICK MINE, Duquesne Light Company, Warwick, Pa. . . . 600 tons per hour crushed, screened; large size washed in tandem-Launder Hydro-Separators, then reassembled with small size; conveyed to barges for power plant use.

★ WINDSOR POWER HOUSE COAL CO., Wellsburg, W. Va. . . . Coal for power plant use crushed, screened; large size washed in Hydro-Separators and recrushed, small size by-passed, two sizes reassembled. Capacity, 450 tons per hour.

How leading operators are solving their particular problems of preparing coal to meet the demands of postwar markets, is well illustrated by these up-to-the-minute, efficient plants in the Pittsburgh district—plants designed and built by Roberts and Schaefer.

These plants prepare coal for metallurgical processes, power plant needs, and industrial uses. Their equipment includes dry cleaning and wet washing



★ CLYDE MINE, Republic Steel Corp., Fredericktown, Pa. . . . Capacity, 700 tons per hour. Run-of-mine coal is crushed, washed in Baumtype jigs and Hydrotator units, conveyed to barges. Complete recovery of all solids and water.

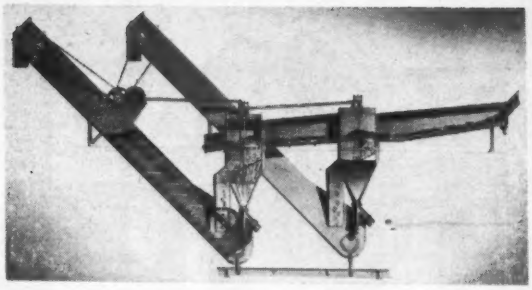
★ MUSE MINE No. 3, H. C. Frick Coke Co. . . . Larger sizes washed in tandem-launder Hydro-Separators, crushed middlings recleaned in Hydrotator units. Loaded by sizes or reassembled. 500 tons per hour.

... are you prepared?

processes in various combinations—each plant designed specifically to meet individual preparation requirements.

This is the established Roberts and Schaefer method—a thorough, exhaustive engineering analysis of your particular problem by a group of trained, experienced specialists; and a plant designed and built to solve that problem.

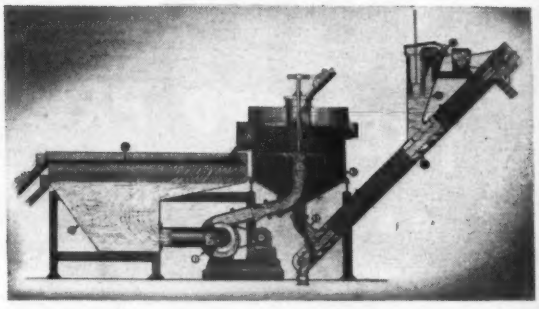
You'll find the R and S descriptive bulletins helpful. Write for them.



For all coarse coal washing

HYDRO-SEPARATOR

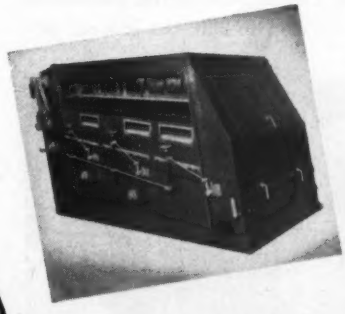
Improved Launder Type



For efficient washing of small sizes

THE HYDROTATOR

Automatic, simple, economical



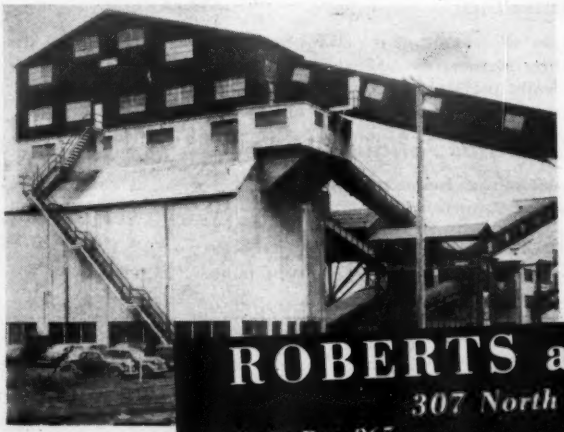
For low cost dry cleaning of fine coal

STUMP AIR-FLOW

★ **CRUCIBLE FUEL DIVISION, Crucible Steel Co. of America, Crucible, Pa. . . . Coal for metallurgical use, crushed and screened; large size washed in Hydro-Separators; small size in Hydrotators; then reassembled for shipment. 400 tons per hour.**

R AND S COMPANY

MATHER MINE, Mather Collieries Co., Mather, Pa. . . . Coal for metallurgical use, 450 tons per hour. Coarse coal is washed in tandem Hydro-Separators, fine coal dry cleaned in Stump Air-Flow Boxes. ★



ROBERTS and SCHAEFER CO.

307 North Michigan Avenue, Chicago 1

P. O. Box 865
PITTSBURGH, PA.

P. O. Box 570
HUNTINGTON, W. VA.

HARD GROUND

SOFT GROUND

FITCHERY GROUND

THE FEED PRESSURE IS CONSTANT

THE SPEED RESPONDS *Automatically* TO THE BIT PENETRATION

Maximum drilling speed in any type of ground . . . that's what the "CF" Continuous Feed of Gardner-Denver CF-89H Drifters assures.

The "CF" Continuous Feed is an exclusive Gardner-Denver development that automatically feeds the drill to suit the ground. With Feed Throttle set for the ground, the rest is automatic—the drill will advance as fast as the bit penetrates. The type of ground being drilled actually regulates the speed of the feed—the pressure of the feed remains constant for a given throttle setting.

WHY "CF" CONTINUOUS FEEDING MEANS FASTER DRILLING

No Time Lost for Adjustment

The drill runner loses no time and the drill loses no footage from frequent manual adjustment of the speed while drilling. The "CF" does the job automatically.

Correct Striking Position Always

The "CF" built-in motor feeds the drill continuously to the correct striking position for maximum drilling efficiency and maximum chuck life.

No Crowding

Simple adjustment of the "CF" Feed Throttle will increase the feeding pressure for harder ground or for a dull bit and automatically maintain maximum drilling speed without crowding the rotation. Excessive wear is eliminated.

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Elimination of frequent adjustment plus ease of control cuts down operator fatigue.

For complete information on Gardner-Denver CF-89H Drifters and their elastic pressure feed, write for descriptive bulletin. Gardner-Denver Company, Quincy, Illinois.

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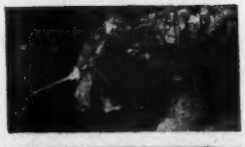

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- ★ **PERMISSIBLES**
- ★ **BLASTING POWDER**
- ★ **BLASTING ACCESSORIES**

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Where there is no mechanical contact between moving parts, no wear can take place. This is the principle which P&H uses to transmit power for hoisting the dipper of the new P&H Electric Shovel. . . . The *Magnetorque Drive* transmits torque by electro-magnetic forces rather than by mechanical contact. Designed specifically for Electric Shovel operation, it eliminates motor commutation problems, sliding gears, mechanical clutches and other complicated mechanisms. Reversing the hoist motor is no longer necessary. Hoisting is completely independent of all other operations.

The *Magnetorque Drive* is typical of the advanced engineering and simplicity embodied in every detail of the new P&H Electric Shovel. Write for full information about the new P&H Electric Shovels.

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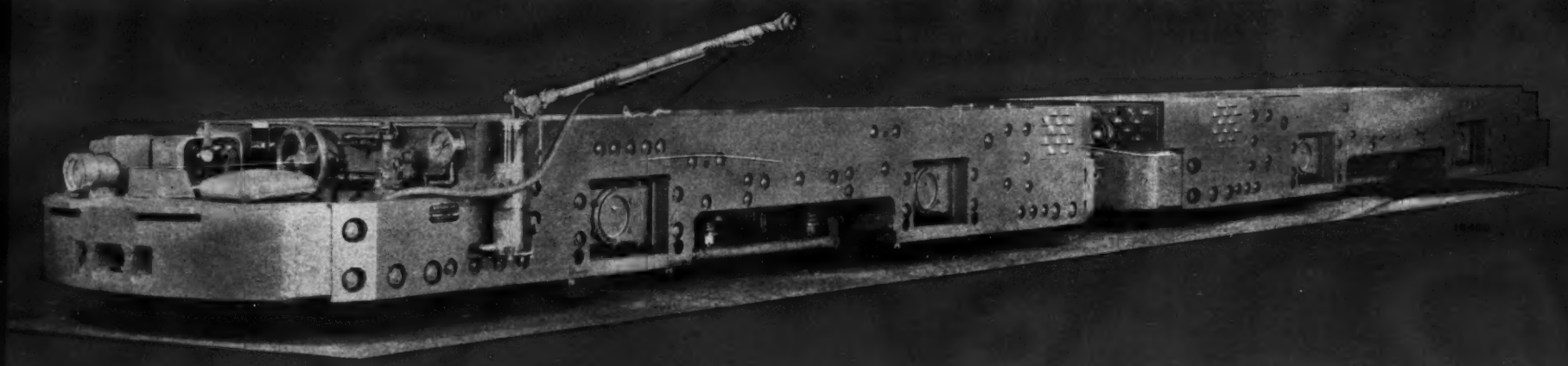
For Your Long Main Line Hauls

GOODMAN TANDEM LOCOMOTIVES



With a powerful Goodman tandem unit on the job you can be sure of efficient, positive transportation for your heaviest main line loads.

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GELEX stays put...doesn't ravel in uppers

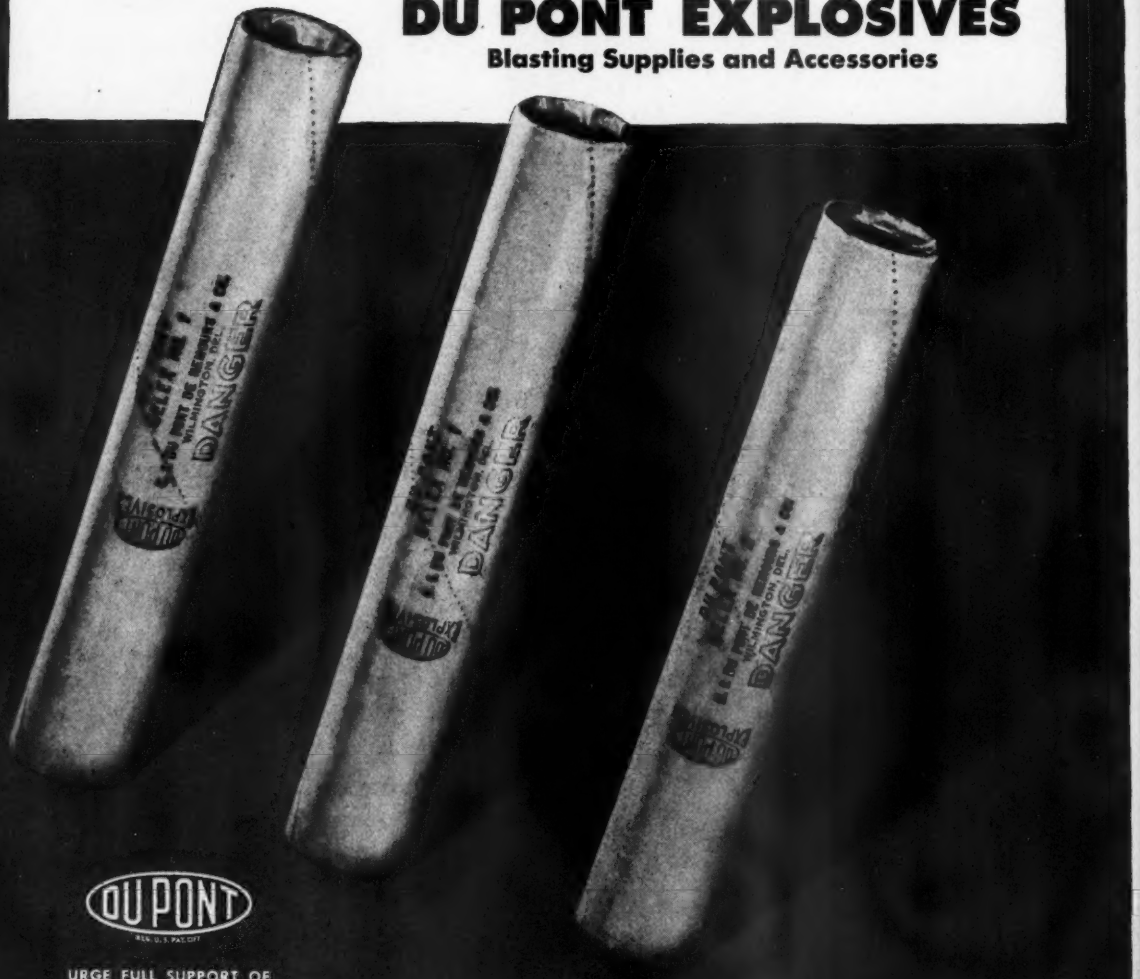
DU PONT GELEX—a semi-gelatinous, medium velocity dynamite—is widely used in shooting hard, soft and intermediate ores.

GELEX loads easily and stays put. It permits rapid, more effective loading. A cohesive dynamite packed in perforated cartridges, GELEX eliminates raveling in uppers . . . saves time because slitting is unnecessary. It's a practical dynamite wherever cohesiveness and moderate water-resistance are factors.

Here's a dynamite that actually costs less—stick for stick—than gelatins of comparable strength, and it is often substituted for them. Ask your Du Pont Explosives representative for complete details. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT EXPLOSIVES

Blasting Supplies and Accessories



DU PONT

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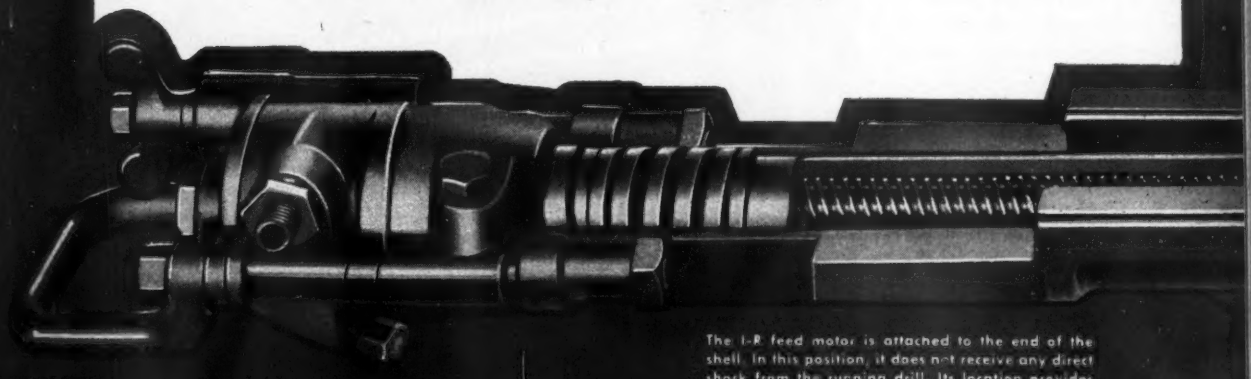
U. S. ARMY NURSES CORPS
NURSES ARE NEEDED NOW!

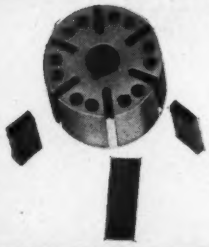
INCREASE DRILLING SPEED . . .

WITH POWER-FEED

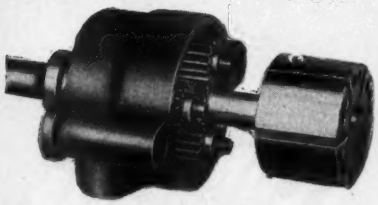
All Ingersoll-Rand drifters are extremely fast drillers, but men using them become even more productive if these powerful and durable machines are equipped with Power-Feeds. The Power-Feed will keep the drills cutting rock a greater percentage of the time. Steel changes are made much more rapidly, the drill operator is less fatigued at the end of the shift, and there is no letdown in his rate of drilling. These are all factors leading to greater footage per man-shift.



The I-R feed motor is attached to the end of the shell. In this position, it does not receive any direct shock from the running drill. Its location provides safety. Only one size of Power-Feed is used on all I-R Drifters. There is no need to stock different sizes of repair parts.



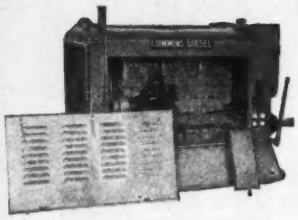
The rotor is the only major moving part of the I-R Power-Feed motor. This motor, therefore, requires very little attention beyond the occasional replacement of a vane.



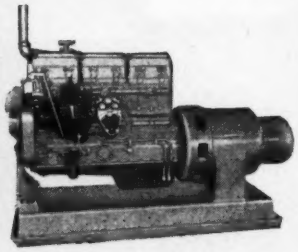
Roller bearings are used on the driveshaft and a simple method of gearing provides a dependable feeding action. Forty different positions on the feed throttle permit the proper adjustment for any kind of rock condition.

The I-R Power-Feed is safe. The stationary controls are always within reach of the operator. The drill can be run close to the rib or slung under the bar without endangering the fingers.

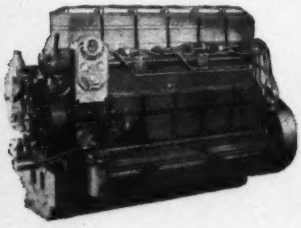
Ingersoll-Rand



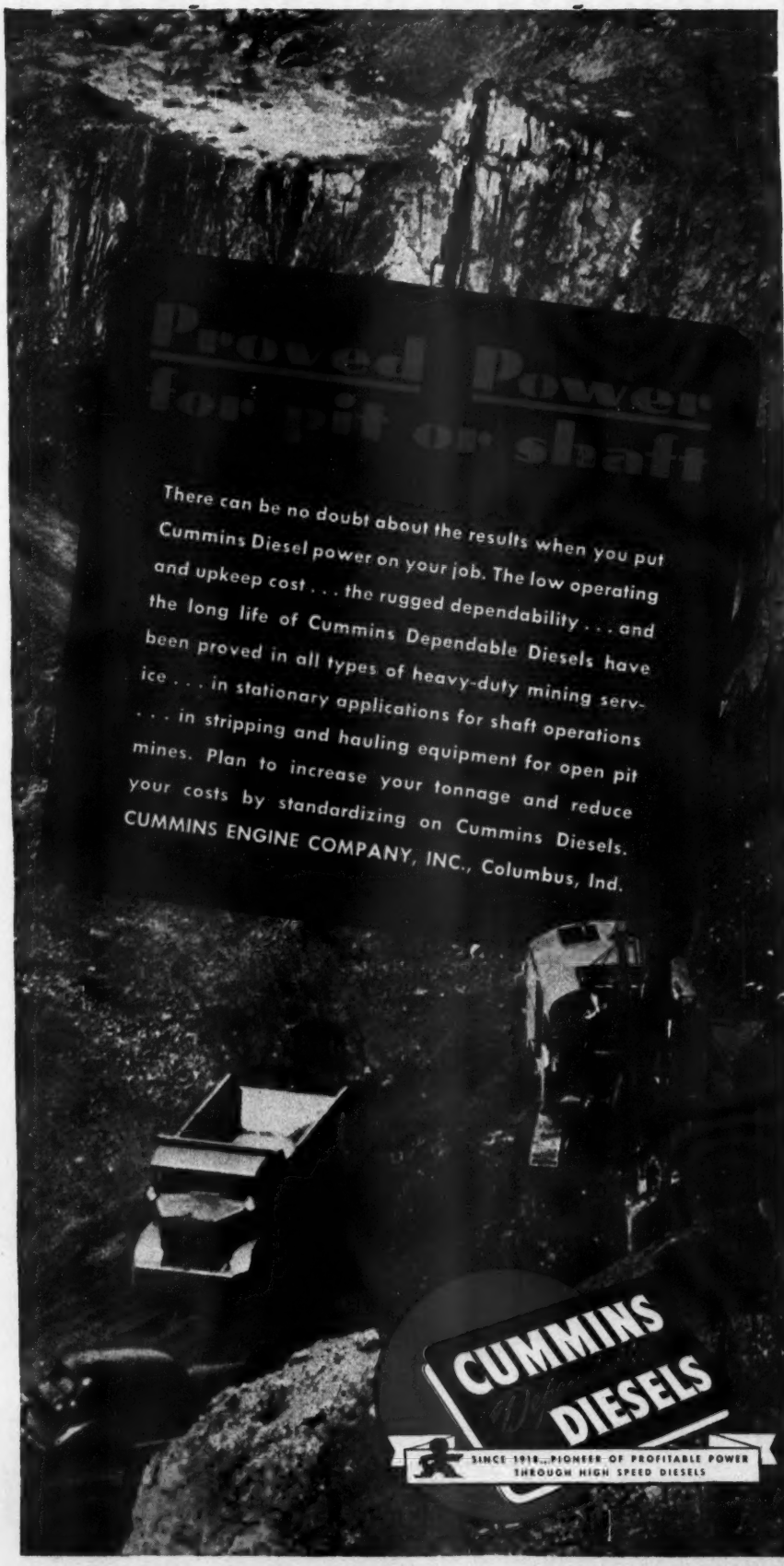
The Model HP-600 Cummins Diesel is one of several types of portable and stationary industrial units offered for service in the mining industry. The six-cylinder, 672 cu. in. Model H, which produces its maximum 150 hp. at 1800 rpm., was developed in 1932—is the *original* high-speed diesel . . . has been employed in a greater variety of automotive, industrial and marine applications than any other American-built diesel.



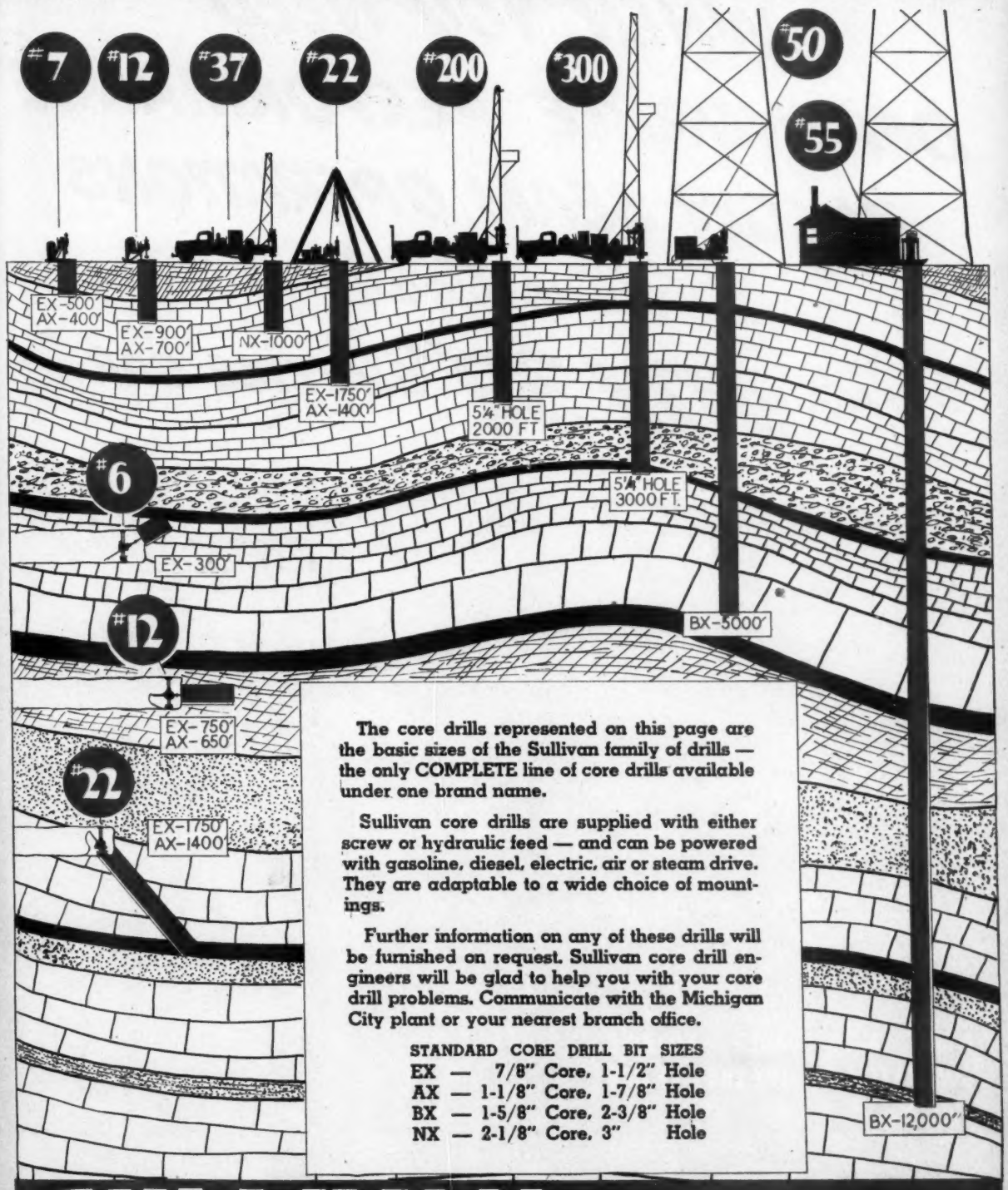
The Model H Cummins Diesel is offered in both AC and DC generating sets of 35 and 50 kw. capacity. The Cummins Diesel's quick cold-weather starting, its low operating and maintenance cost are your assurances of lower power costs and uninterrupted production.



Shown here is the Model L Cummins Diesel as offered for such portable industrial applications as shovels, draglines, cranes, locomotives, etc. This 7" x 10", medium speed diesel, which produces its maximum 250 hp. at 1000 rpm., is also designed for stationary service, being manufactured in several types of power units and also in 100 and 125 kw. generating sets.


Proved Power
for pit or shaft
There can be no doubt about the results when you put Cummins Diesel power on your job. The low operating and upkeep cost . . . the rugged dependability . . . and the long life of Cummins Dependable Diesels have been proved in all types of heavy-duty mining service . . . in stationary applications for shaft operations . . . in stripping and hauling equipment for open pit mines. Plan to increase your tonnage and reduce your costs by standardizing on Cummins Diesels.
CUMMINS ENGINE COMPANY, INC., Columbus, Ind.
CUMMINS
DIESELS
SINCE 1918...PIONEER OF PROFITABLE POWER THROUGH HIGH SPEED DIESELS

SULLIVAN — THE WORLD'S LARGEST FAMILY OF CORE DRILLS



The core drills represented on this page are the basic sizes of the Sullivan family of drills — the only COMPLETE line of core drills available under one brand name.

Sullivan core drills are supplied with either screw or hydraulic feed — and can be powered with gasoline, diesel, electric, air or steam drive. They are adaptable to a wide choice of mountings.

Further information on any of these drills will be furnished on request. Sullivan core drill engineers will be glad to help you with your core drill problems. Communicate with the Michigan City plant or your nearest branch office.

STANDARD CORE DRILL BIT SIZES

EX	**— 7/8" Core,**	**1-1/2" Hole**
AX	**— 1-1/8" Core,**	**1-7/8" Hole**
BX	**— 1-5/8" Core,**	**2-3/8" Hole**
NX	**— 2-1/8" Core,**	**3" Hole**

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ROCK DRILLS • AIR COMPRESSORS
SCRAPER HAULERS • HOISTS • LOADERS
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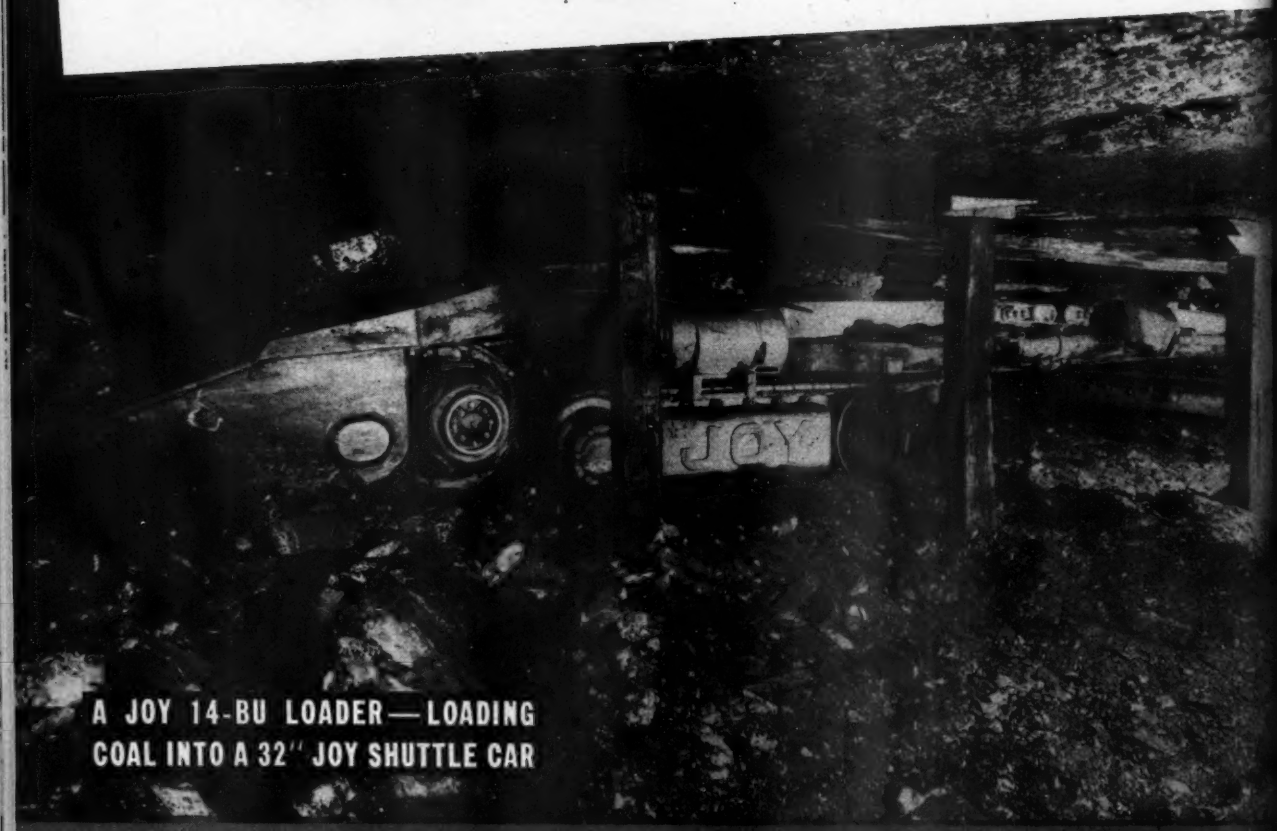
WHEN YOU NEED DEPENDABLE PERFORMANCE IN LOW SEAM OPERATIONS

Investigate THE JOY 32" SHUTTLE CAR



A JOY 14-BU LOADER—LOADING COAL INTO A 32" JOY SHUTTLE CAR

Cable Reel Type 32" Shuttle Car. Accomodating a cable reel of 600 ft. length with a cable back-spooler permitting 1200 ft. travel both directions. This model may be adapted for trolley type of service, too.

Rear View of 32" Model. Notice the extra-low rear bumper (20" from ground) which permits loading from low height loading machines in very narrow seams.

It Gives

ECONOMY OF OPERATION . . . . LOW UPKEEP COST

Operating costs can be cut by using shuttle car secondary haulage, which allows maximum operating efficiency for loaders and lowest haulage cost from working face.

and Gives

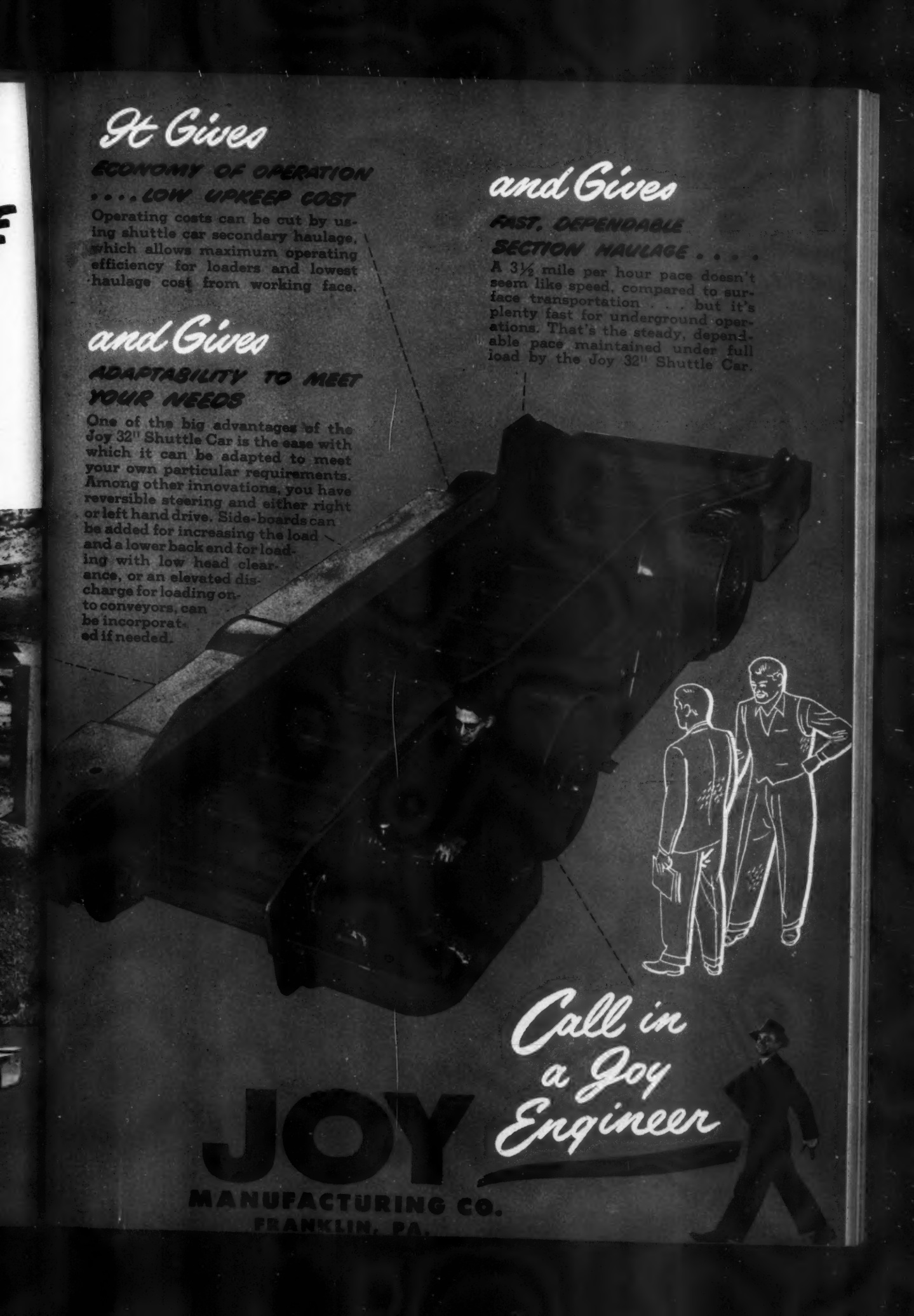
ADAPTABILITY TO MEET YOUR NEEDS

One of the big advantages of the Joy 32" Shuttle Car is the ease with which it can be adapted to meet your own particular requirements. Among other innovations, you have reversible steering and either right or left hand drive. Side-boards can be added for increasing the load and a lower back end for loading with low head clearance, or an elevated discharge for loading onto conveyors, can be incorporated if needed.

and Gives

FAST, DEPENDABLE SECTION HAULAGE . . . .

A 3½ mile per hour pace doesn't seem like speed, compared to surface transportation . . . but it's plenty fast for underground operations. That's the steady, dependable pace maintained under full load by the Joy 32" Shuttle Car.



JOY MANUFACTURING CO.
FRANKLIN, PA.

Call in a Joy Engineer

Mining
CONGRESS JOURNAL

Published for the Entire Mining Industry by The American Mining Congress
S. A. TRENGOVE, Editor

Volume 31 FEBRUARY, 1945 Number 2

Don't Belittle Our Mineral Resources

"OUR iron mines can't last ten years"; "we'll soon be a 'have not' nation in zinc and copper," etc. Misleading statements of this sort today plague the thoughts of Americans.

Some quarters even propose that we close our mines and let them stand idle until needed in the next war, and naively label this plan a safeguard against attack! The companion suggestion is that we place the very roots of our economy in foreign soil by importing the bulk of our mineral.

There are so many things wrong with this approach to our ore supply problem that one wonders how to deflect and dissipate the wave of misconceptions now threatening to play havoc with American metal mining.

Some of the international economists, seeing that our proven ore reserves are running low, seem to have missed several facts: (1) The current production pace has merely outdistanced exploration programs and since to find ore you have to have time to hunt for it, we must postpone some of this hunting till after the war; (2) ore search techniques are constantly improving through the advance of geophysics and geological interpretation—successful prospecting at depth is assuredly on the near horizon; (3) ever-improving methods of ore production and benefication are constantly making lower grade materials merchantable. Our miners, technologists and executives possess the "know how" to perpetuate American metal mining for many decades to come and collectively represent a type of inimitable resource which is a far greater safeguard to security than could be represented by any number of mines *without* such men. Can we afford to toss this matchless asset and the western economy that depends upon it to the four winds?

In event of war, under the "have not" plan, we would supposedly have a lot of mines to pump out, re-timber, re-equip and re-man. What a job that would be! A modern war would probably be over before production could get started! Nice for the enemy! Funny thing, too, *somebody* would have to keep the needed machinery and supplies standing by.

While such a program is hopelessly absurd, it has been proposed, and we miners face the task of setting the public straight. What's more, we'd all better take a hand in it forthwith because too many people are unaware of the real facts.

We like what Ira Joralemon said on this subject in Denver the other day. Pointing to our strong potentialities in technology and ore reserves, he noted, "Nature will continue to make us the most favored nation, if we have intelligence enough to make the best use of her favors. The ore is there, and the spirit of adventure that made the country great will find the ore as long as the rules of the game—taxation and government control—let the best man win."

"Accentuate the Positive"

"ELIMINATE the negative." These words from a current top-hit tune might well be affixed to the battle flags of the coal industry as it goes forward to meet the impending coal crisis. With the biennial wage contract negotiations close at hand, informed observers expect the bargaining to follow much the same pattern as in the past. John L. Lewis can be counted on to make certain demands, perhaps for a direct wage step-up, perhaps for certain "fringe" concessions such as increased travel-time pay and the like.

Mine operators will have to refuse these demands, because they *can't* accede. Government agencies like OPA and WLB et al. have them so fenced in that there isn't a chance of agreement *until somebody opens the gate* and makes possible an equitable solution of the problem.

Meanwhile the Solid Fuels Administration for War (albeit wearing well-deserved fresh laurels for its performance to date in equa-spreading coal supply) has stated publicly that 620,000,000 tons of bituminous coal will be needed in the coal year 1945-46, but that estimated production will fail to meet this need by 40,000,000 tons. Solid Fuels' current regulations seem based on the assumption that the shortage is unavoidable and that thinner spreading than ever is in order.

"Latch-on to the affirmative" rings the song again as we point out that the needed coal *can* be produced, as was demonstrated by the mines in 1944. Why then the negative approach? We cannot concur in it.

Is it manpower that's holding up this critically needed commodity? In part, yes. But surely, for something so urgent, Selective Service can help—as for instance, by ceasing the draft of miners forthwith; by bringing back to the mines some of the experienced miners now in service, and by looking into attendance records of deferred miners with a view to curbing absenteeism. Work stoppages from any cause are at the moment unconscionable. If present working hours are not adequate to get the needed tonnage, what about an additional hour each day of productive working time?

What about machinery and supplies? Surely the powers of WPB (already proven so capable) are sufficient to meet the emergency.

Finally, if a product is expected to appear on the market in adequate volume, fair and reasonable profit must be in view. Congress clearly recognized this relationship when it set up the Emergency Price Control Act of 1942. Yet OPA tells coal producers they need not seek price relief—*unless they are losing money!* How utterly unfair! More recently this agency has upset normal cost accounting by excluding percentage depletion (although expressly allowed in the Internal Revenue Code)—thus treating a recognized cost of production as if it were part of the operating margin.

If OPA, WLB and other Government agencies will stress *production incentive*, discontinue present discouraging tactics, and take positive action to solve the wage controversy before an impasse develops, adequate coal production can be had. If such a course is not followed, some one (War Mobilization Director Byrnes maybe) may have to say, "Come on boys, we need that coal—'and don't mess with MISTER IN-BETWEEN!'"

Review AND Outlook FOR MINING

Railroad entrance to the Oliver Iron Mining Company's Hull-Rust mine at Hibbing, Minn. Diesel and steam-powered trains pass here every few minutes hauling iron ore to crushing plant or assembly yard or returning empties to the pit. A modern block-signal system controls train movements at this point

METAL MINING PROGRESS

Technological Advance Retarded Due to Pressure of War Effort But Important Progressive Trends Continue

By E. R. BORCHERDT

Research Engineer
Anaconda Copper Mining Co.

THE critical manpower shortage which existed during the greater part of 1944 resulted in a substantial loss in ore production in the metal mining industry. This condition was generally more acute in the western states where production reductions were greater in underground mines than in open pit operations. In some cases operators were able to utilize unused concentrator capacity by supplementing regular ore feed with material obtained from low grade dumps or from tailings deposits amenable to retreatment.

The pressure of war production made it impossible to allocate engineering effort to the development of new mine equipment.

The combined effect of these conditions was a definite brake to the development of new and improved mine practices.

Little in the way of increased efficiency through the use of new developments in extraction methods was disclosed. In fact, some cases are known where the maintenance of maximum production involved the sacrifice of efficiency and recoveries. Manpower shortages forced an increased use of mechanized equipment and also focused attention on the advantages to be gained from personnel training. The Anaconda Company at Butte has undertaken two important steps in personnel work since the United States entered the war. One is the plan for training miners, which has been publicized in the technical press; the other is the institution of training courses for supervisors or more particularly for shift bosses. These are in addition to the Government-sponsored "Training Within Industry" service of the War Manpower Commission. The supervisors' training courses have continued to function as supplementary training for bosses. All supervisors attend these courses for three days every six months, during which time they are given technical information, and take part in discussion of company rules and procedures, and in foremanship conferences on production problems. The effect of this training program is recognizable in increased underground efficiency.

The heavy drain of wartime production on iron ore reserves in the Lake Superior district has crystallized the attention of forward looking

iron ore mining companies to the importance which beneficiation of low grade ores must play in future ore production.

Drilling and Blasting

There was no special advance in the technological phases of diamond drill blast hole operations during 1944. However, in view of the higher tonnages per man shift which are possible with this method, its expanded use during a period of labor shortage was a natural outcome. Several companies have carried on experimental work in making initial openings in rock with deep burn cut rounds drilled with diamond drills. The expansion of diamond drill stoping methods has been much greater in Canada than in the United States as is shown by the following list of mining companies using these methods:

United States

Howe Sound Company, Chelan Division, Holden, Wash.
National Tunnel and Mines Company, Tooele, Utah.
Mountain Copper Company, Matheson, Calif.
U. S. Vanadium Company, Bishop, Calif.
Tennessee Copper Company, Ducktown, Tenn.
Oliver Iron Mining Company, Duluth, Minn.

Quebec

Noranda Mines, Ltd., Noranda.
Aldermac Copper Corporation, Arntfield.
Waite-Amulet Mines Ltd., Noranda.
Powell-Rouyn Gold Mines, Ltd., Noranda.
Canadian Malartic Gold Mines, Ltd., Malartic.
Siscoe Gold Mines, Ltd., Siscoe.
Sladen Malartic Mines, Malartic.
Canadian Refractories, Ltd., Kilmar.
East Malartic Mines, Ltd., Norrie.
Arntfield Mine Corporation, Arntfield.
Johnson's Company, Thetford Mines.

Ontario

Aunor Gold Mines, Ltd., Timmons.
International Nickel Company of Canada, Copper Cliff.
Kerr-Addison Gold Mines, Ltd., Virginiatown.
Matachewan Consolidated Mines, Ltd., Matachewan.
Pamour Porcupine Mines, Ltd., Pamour.

British Columbia

Granby Consolidated Mine, Smelting & Power Co., Ltd., Copper Mountain.
Consolidated Mining & Smelting Company of Canada, Ltd., Kimberley.

Mexico

Cananea Consolidated Copper Company, Cananea, Sonora.

Late in the year a new diamond drill designed especially for blast hole work was introduced in which power is transmitted directly from the main rotor to the drill rod by means of a quill which passes through the rotor.

Nothing particularly novel in the way of percussion rock drill design was brought out during the year, although some refinements in the finish of parts, such as honing and rustproofing were extended. Increased attention is being paid to the application of air feeds similar to those of the reverse feed stoper for the attachment of both sinker and drifter drills. There was also an increase in the use of pneumatic column bars upon which reverse feed stopers and power feed drifters are mounted. Further designs of small drill carriages which utilize air-operated bars to hold them rigidly in place have made their appearance.

Experimental work has been carried on during the year with rock drill lubricants to reduce fogging and to provide an oil with a more pleasant odor without sacrificing resistance to water removal. Experiments with small hole drilling in which detachable bit starters of 1⅝-in. gauge and ⅛-in. changes are used with ⅞-in. quarter octagon steel and 3-in. drifter drills have been in progress during the year.

Underground calyx drilling largely for ventilation purposes was carried on throughout the year by at least one large mining company.

At the Sherwood mine a 12-in. churn drill hole 1,000 ft. in depth was enlarged to 30 in. in diameter by a novel reaming process.

There has been a continued trend toward the use of burn or shatter cut rounds for drifts and crosscuts. However, in order to keep powder consumption within reasonable limits, cut holes must be drilled parallel and the intelligent use of spacers must be followed. In some cases a large center break-to hole is drilled with special detachable bits and rods, in others by diamond drill bits of a maximum of 6 in. in diameter. In some shaft sinking operations burn cuts were used to break to a previously drilled churn drill hole.

Loading and Scraping

Very little in the way of design changes in mechanical loaders has been forthcoming during the year, although improvement in the quality of repair parts has resulted from improved steels and heat treatment methods. Promising results have been obtained from experiments with a power operated hose reel attached to the loader in reducing damage to air hose.

In addition to the expansion of mechanical loading in development headings there have been several recent applications of mechanical loading of stope rock which is run by gravity into sill drifts from the stopes through draw holes.

Scraper hoist designs have remained unchanged during 1944 with the exception of a small light-weight portable hoist, which one manufacturer has provided with a substantial increase in power without sacrifice to its portability. One manufacturer reports progress in developing a scraper hoist equipped with fluid drive.

In open pit truck haulage the trend is toward larger units

Several instances of the replacement of loading chutes by short haul scraper installations, where large tonnages are available for loading into cars, were made during the year.

In the Lake Superior iron country, underground storage pockets have in some cases been replaced by storage trenches, from which materials are fed into the measuring pockets prior to loading into skips. This practice is particularly adaptable to wet sticky ores which are difficult to load into skips and it has the further advantage of serving as a surge bin to level off fluctuations in production.

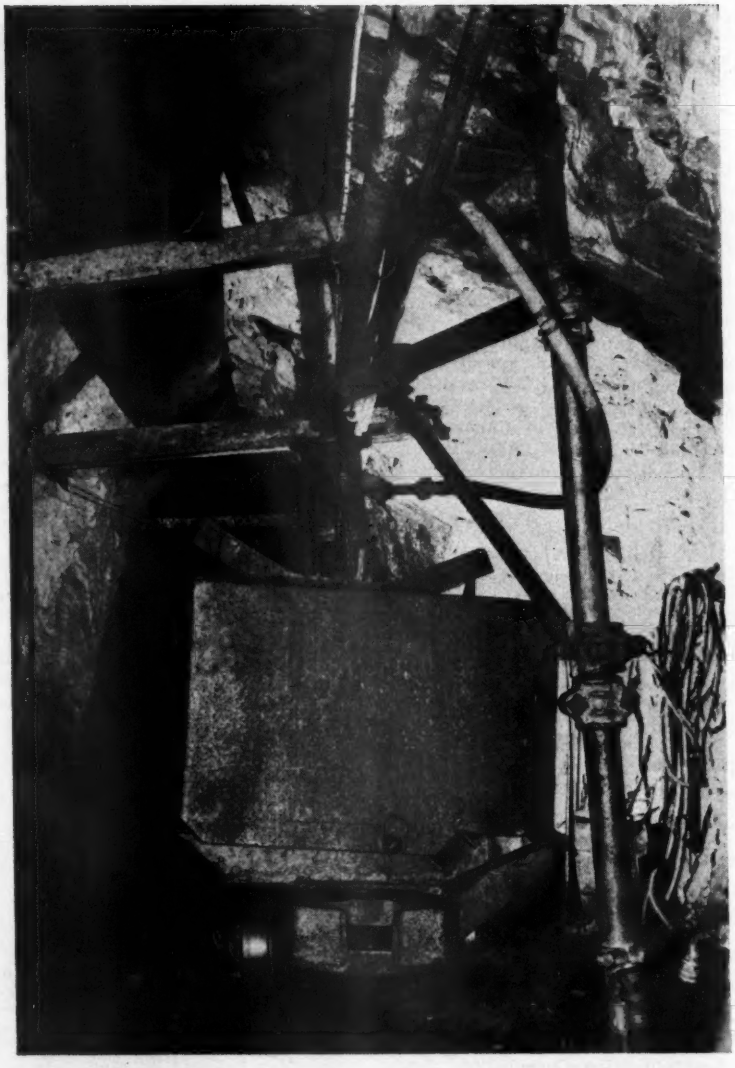
Haulage

In underground haulage there is a definite trend towards the use of larger and heavier equipment, which in turn requires the use of mechanical brakes. Experiments with electrically operated brakes are in progress at one property. Cars of the Granby type seem to be increasing in popularity. An air cylinder attachment for bypassing a Granby dump has been perfected.

At the Climax mine where sticky ores tend to build up on the large Granby type car bottoms an air operated cleaning blade has been perfected.

At Tooele, Utah, a simple and effective cherry picker, shown in accompanying photograph, was constructed from standard 3½ in. column bar with double jacks, standard arm and air cylinder and bar equipped with car hooks. To date this equipment has handled more than 8,000 2½-ton cars without requiring repair. The transfer of an empty car from one end of the train to the other requires an average of 30 seconds.

Additional application of shuttle cars was made in the Tri-State district.



"Cherry Picker" car transfer used at National Tunnel and Mines Co., operation at Tooele, Utah

Hoisting

Few innovations in design with the exception of controls were incorporated in the several large hoists which were installed during the year. A number of Rototrol or Amplidyne controls were also installed in several existing hoist installations. In Butte, a reciprocating steam hoist was converted to a direct connected electrical hoist driven by a 1,000-h.p. motor. A slack rope signal is a recent development whereby an electronic device attached to the cage or skip draw bar warns the engineer when, for any reason, rope tension is relieved.

Several additional bottom dump skip installations were made during the year. This skip was developed primarily for the purpose of transferring waste to various underground levels, but in view of the fact that it operates at 100 percent skip factor its use in hoisting ore and waste to surface has been found advantageous. During the past year a fully automatic door-opening device on these skips was perfected. This consists of a combination of two cable chains attached to the upper corners of the door; two sheaves rigidly mounted on the sides of the skip approximately 5 ft. above and directly in line with the chain fastenings on the door; and two actuating levers on which trunnion wheels are conveniently mounted. The bottom ends of the levers are mounted on the spindles, leaving the upper ends free. The cable chains are passed upward from the door over the sheaves and fastened to the free end of the actuating levers. These actuating levers are vertical when the door is in a closed position. Retractable trunnion wheel guides must be installed at all dump points. These guides are of predetermined contour and as the trunnions engage in them the lever arms are forced from a vertical to a horizontal position. This motion of the levers is transferred by means of the cable chains to raise the door. As the trunnions pass out of the guides the levers are returned from the horizontal to the vertical position by the weight of the door.

At Cananea an inclined skipway was recently put into service to lower open pit ore in 40-ton skips from truck dumping points at elevations 6105, 5985, and 5865 to the primary crushing plant at elevation 5745. Skips are operated in balance through a 12-ft. drum hoist geared to two 600 h.p. induction motors equipped with controls for dynamic and regenerative braking.

A novel hoist layout at the new Mather mine has eliminated the use of idler towers by bringing the rope from the head sheave to a large sheave at the base of the headframe, then horizontally to the hoist drums.

Pumping

During the year the major portion of the 3,800 drainage level development and central pumping plant which handles all lower level mine water in the Butte district was put into operation. This water, which is highly corrosive, requires the use of a special stainless steel alloy in the centrifugal pumps.

Ventilation

A trend in propeller mine fan design is that maximum tip speeds seem to have been reached and lower speeds are now being contemplated.

The use of Diesel power mine locomotives which have passed U. S. Bureau of Mines permissibility tests is now feasible in coal mines or other underground operations where inflammable gases and dusts may be encountered.

Increased thought is being given to the development of nesting laminated wood or plastic tubing which would have increased durability over present ventilation tubing.

Shaft Sinking

A knuckle shaft at the Pioneer mine was commissioned during the year. On account of a surface condition it was necessary to sink an inclined shaft from surface to the 700 ft. level where it was connected with an existing vertical shaft.

During the year several vertical shafts were sunk in Montana and Wyoming with the Longyear mechanized shaft mucking system.

Some unusual advances were made in sinking shafts inclined up to 25 degrees with Eimco loaders.

The 750 ft. vertical shaft of the Mammoth St. Anthony Company, which was destroyed by fire, was quickly and safely retimbered by filling the entire shaft with sand tailings which were drawn out of the bottom of the shaft as timbering was advanced from the collar.

Considerable interest has been manifested in the experimental use of laminated fir guides in the Butte district. The attainment of advantages of extreme wear resistance of end grain wood with the elimination of splintering hazards have been made possible by recent developments in high strength thermal-setting, plastic glues which are unaffected by moisture.

Mine Tools and Underground Equipment

Distinct advances in the quality of mine equipment fabricated from synthetic rubber have been noted during the past year. This applies to air and water hose and electric cable covers as well as conveyor belts and moulded rubber linings and coverings used for abrasion or corrosion resistance.

The use of storage batteries to replace dry batteries in flashlights is an effective solution of the dry battery shortage.

A portable pneumatic reciprocating saw which is being successfully used for underground timber salvage made its appearance during the year.

Open Pit

In the Lake Superior district, open pit rail haulage trends are toward the use of Diesel-electric locomotives because of their ability to perform on heavy grades of from 3 percent to 5 percent and around sharp track curvatures up to 25 degrees. One large operator now has 28 of such locomotives in service. The advantages of Diesel-electric locomotives over steam locomotives are as follows:

1. Lower operating cost.
2. Higher availability (these engines are available from 90 percent to 95 percent of their time for haulage purposes).
3. Greater traction (less wheel slippage).
4. The present available locomotives of this type are 1,000 h.p., (although at some operations a larger locomotive, 1,500 to 2,000 h.p., is desirable).

Where locomotive haulage is used, stripping materials are hauled to the disposal dumps in 30 cu. yd. roller bearing, air-dump cars. These cars are light in weight, due to the use of alloy steels, with the result that larger pay loads may be hauled in the trains.

In truck haulage the trend is toward the use of larger haulage units of end dump and side or bottom dump trailer types. The capacities of these units are being increased from 30,000 lbs. to 60,000 lbs. or more.

There appears to be a trend toward the replacement of several all-truck haulage systems by truck-conveyor system of haulage. This method has its advantages, particularly where the pits have become very deep and where truck roads in the pits are difficult to maintain. Conveyor haulage systems have the following advantages over other methods:

1. Lower operating and maintenance cost.
2. Less rubber consumption per ton of material hauled as compared with all truck haulage (this is of particular importance at this time when the truck tire situation is so critical).

From the above it is apparent that haulage methods in the open pits have become very fluid. Truck, belt-conveyor and locomotive haulage methods are used in different combinations to fit various mining conditions.

Electric shovels of 5 and 6 yd. capacity are receiving preference and there appears to be a trend in this direction away from the smaller size (2½ cu. yd.) units. These shovels are electric powered and are well adapted for loading into the larger size haulage trucks. When smaller trucks are used, the shovel must conform and then the 2½ bucket capacity shovel is used. The major portion of these smaller shovels are Diesel powered.

In open pit copper operations steam locomotive haulage is being rapidly replaced by electric and Diesel-electric locomotives. Truck haulage has a very definite field which may or may not be in conjunction with other types of haulage. In rail haulage there is a definite trend toward the use of automatic block signals and some experimental work has been done with two-way radio communication.

Churn drill blast hole drilling trends have been toward the general adoption of 9-in. bits and in the newer equipment installations advantage has been taken of the high drill footages which are possible with the use of heavy drills which use tool strings weighing 4,000 lbs. and upwards.

Experiments with L.O.X. explosives were made during the year at one of the open pit copper properties.

The use of electric tie tampers and mechanical spike pullers was observed in several open pit operations using rail haulage.

General Maintenance

Difficulties in obtaining deliveries of replacement parts have resulted in the application of greater efforts in the salvage and reconditioning of broken or worn machine parts. Welding, with both gas and electrical methods, continued to be the mainstay of this reconditioning work.

The metallizing process which has found wide application in other industries is gaining favor in mine shops. It has been especially valuable in reclaiming worn or scored shafts and in spraying stainless steel on worn or corroded pump parts requiring building up.

Hard surfacing with application of stellite and chilled cast iron continued to increase the life of equipment exposed to severe abrasion.

Trends in MECHANICAL MINING Of Underground Bituminous Coal

Transfer from shuttle to mine cars is sometimes accomplished through the use of depressed track

Production from Mechanized Mines Has Increased from 0.35 Percent in 1923 to Over 40 Percent Today

By J. H. FLETCHER
Consulting Engineer
Chicago

THE coal industry of the United States produced the largest annual tonnage in its entire history during 1944. The magnificent record established in the all-out effort to keep coal off the ration list is the result of conforming to the mechanical age and not depending entirely on hand labor for coal production.

Over the last 30 years there has been a constant demand for equipment to perform the several mining operations at an increased rate, to which the manufacturers have responded with greater capacity machines. This in turn has required changes, until, if there is a trend in the mining of underground bituminous coal at this date, it is from mechanical loading, where emphasis has been placed on face equipment, to complete mechanical mining planned from prospect data on the seam to prepared coal in the railroad car.

Full Mechanization is Slow of Approach

Coal mining has not had the large research staff such as brought rapid improvements in the automotive, steel, and many other industries, and as a consequence it is requiring a longer time to approch full mechanization of the mines. Through the trial and error method, underground mining equipment has been developed, first to handle transportation, second to undercut the coal, and as a third step to replace hand loading with a machine for mechanically loading coal. In 1923 only 0.35 percent of the underground bituminous coal was mechanically loaded, increasing to 24.6 percent by the end of 1938. During the war years this is reported to have reached approximately 40 percent.

The unusual demand for coal and shortage of labor has accelerated the installation of mechanical equipment in underground coal mines. There were about 50 new mines opened in 1944, but a large percentage of the new equipment has gone into existing mines to assist in maintaining output.

Hand Versus Mechanical Loading

The Midwest coal fields of Illinois, and Indiana, with a high wage scale, a coal that could be loaded mechanically and marketed without passing through a washing plant, and having seams of sufficient thickness to allow designers liberal working space in which to install the moving parts of

the new coal digging machines, were the most active in the change-over from hand to mechanical loading. During this early effort mechanical loading was the change made in the mines, as the principal alteration in production method was to replace hand loading with mechanical loading of coal. The mining system, methods of operation, and other equipment remained the same as under hand loading practice. It soon became apparent that unless a larger tonnage-per-man assigned to the loading unit was secured, a lowering of the existing wage scale would render mechanical loading unprofitable. In 1927 this occurred in the non-union coal fields, and in that section of the country the few mines that had installed mechanical loaders set them aside and returned to hand loading.

During the change from hand to mechanical loading, machines to assist the hand loaders had their day, as represented by the hundreds of "pit car loaders" installed in the thick seam mines, and room conveyors in the thin seams. Though mechanical loading with mobile loaders was established in the thick seam mines by 1923, it was not until 1929 when a loading head was developed for shaking conveyors, since become known as "duckbills," that the low seams had an effective means of mechanically loading coal at the working face.

Status in 1928

A critical point in mechanization was reached in about 1928. Taking a mine designed at that time as an example, the first draft of the plans had provisions for either hand or mechanical loading. A decision to secure the maximum tons per-man-employed, with the equipment then available, presented many problems new to coal mining. A concentrated working territory was required, contrary to the scattered territories of hand loading operations; a mining system with less than 90° turnouts was developed; pillar recovery with large loading machines was initiated; slope belt installed rather than vertical hoist; and a de-centralized direct current power system worked out with the electrical manufacturers. The first universal track cutters were used, and the mechanization completed with track mounted loaders and drills, large mine cars, heavy rail, and rotary dump. The mine was engineered from extensive drill hole data, another step toward the future.

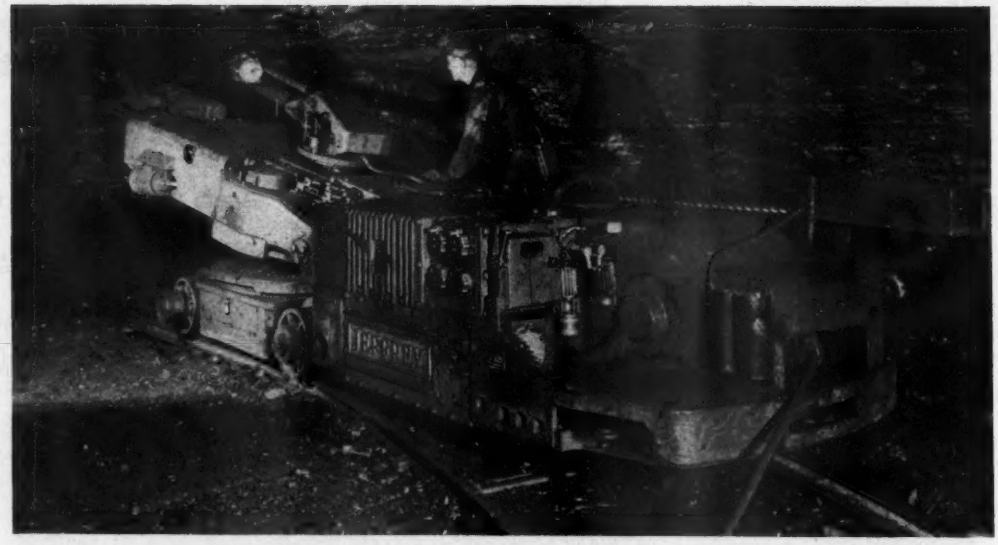
In 1936 a mine was opened in which mobile loaders were used but no track was installed. The coal was cut by shortwall machines and transported from loading machine to mainline belt by haulage units equipped with pneumatic tires. This was the forerunner of the present line of cutting, drilling, loading, and transportation units that are being developed to operate directly on the mine floor.

Recently Opened Mines Have Cost Advantage

Mechanical mining of coal has advanced a long way in the United States; however examination of the records indicates that when the average cost of hand and mechanical mined underground coal is compared, there is but a small margin between the total costs of production. In this it is necessary to recall that the comparison is between the average and not the best of each class, also, that in many cases the mechanized mines are old properties that do not have the latest type of equipment. The recently opened mines, and those now being projected, have a decided advantage over their predecessors in experience, improved equipment, and also management and labor that is mechanically minded.

During the war it will continue to be a drive for the maximum tons from the limited supply of labor, with total production cost in secondary place. But in the post-war market the properties must produce in competition with, not only other mines, but oil and gas used as fuels. Mechanically equipped mines require a

In thick seam mining large efficient cutting machines have been developed to operate directly on mine track



Modern cutting machines have facilities for a variety of services

large capital investment, have high supply, maintenance, and obsolescence costs as compared with hand loading mines, and, therefore, require highest type of management as well as careful planning of the mine and selection of the equipment to assure low production cost. But well equipped and well managed mechanical mines are securing excellent costs and will be in a competitive position with oil and gas.

Through large expenditures in research and development work by the manufacturers and the close cooperation of the coal industry, the problems of mechanical mining have been solved to the point where there is a variety of excellent equipment now available to meet the limitations imposed by the wide variations in coal seams that are being mined.

Trends in Thick Seam Haulage

There are many thick seam mines equipped with mobile loading machines that were opened as hand loading mines before the development of the universal cutting machines, and have shortwall cutting machines, off track loading machines and relatively light mine rail in active mining territory. In these properties there is a growing tendency to replace the secondary haulage with shuttle cars that operate between the loading machines and the mine cars at the room neck, or to panel belts along the room entries that discharge into mine cars on the main haulage line. Mines opened after 1930 frequently installed heavy mine rail, track type cutting and loading machines, and large mine cars. Many of these operations are continuing with the track mounted equipment, adding improved type units when replacements are required, and with the use of cleaning plants at the surface are moving from selective mining, which required hand disposal of refuse at the loading point, to full seam mining and transporting all material to the surface for separation and sizing.

Thin Seam Equipment

In the low seam there is a choice of several combinations of equipment, each with advantages and disadvantages in mechanical mining, but all having the primary aim of a large tonnage from a small unit crew. A popular combination of units is a cutting machine, electric drill and shaking conveyor with duckbill loading head. With this equipment a unit crew is assigned a working place and performs all tasks of cutting, drilling, shooting, loading the coal, and room timbering. While used in thick, pitching seams, this is especially adapted to thin seams having grades too severe for normal car haulage in the room territory; mines that have roof requiring close timbering; or those with soft floors on which the equipment must move.

A second combination that has its exponents is the use of mother belts, drag type chain conveyors in the rooms, a shortwall cutting machine, and a mobile loading machine assigned to one or two rooms. All operations are performed by a unit crew that cut, shoot, load the coal, and take care of the timbering in the working place. Both of these systems require manual handling of supplies, and the detail of advancing the conveyors for each new cut of coal. It is apparent that these systems are best in mines in which on-shift shooting is permitted.

A third combination is that of gathering belt, portable cutting machine, electric drill, mobile loading machines, and rubber-tired or shuttle car haulage. The men of the unit crew are usually assigned to one type of operation, such as cutting machine operators, haulage men, and timbermen. Where seam conditions are suitable for this type of installation, each man becomes a specialist in his work, there is a minimum time required to install and recover equipment, and supplies are delivered directly to the place at which they are used.

Overall Plans Important

The reluctance of the mine operator to approach new methods of coal mining with an open mind is rapidly passing, and it is becoming a general rule, rather than the exception to regard production of coal as the excavation, transportation, and milling of a raw material, rather than an art which requires an individual system of approach and is amenable to no other. Working toward this goal more emphasis is being placed on securing definite information as to seam thickness, grades, roof, and floor, over the entire acreage assigned to the mine, also impurities in the seam, and complete data of the washability of the coal to determine whether or not the impurities can be removed by any of the mechanical devices now available, or must be removed by selective mining, as well as to what markets the coal can be shipped. It is now realized as necessary for an operator to know as much about the raw product before the mine is opened, as any other manufacturer, though the budget required to gain this information is relatively large.

When mines were opened for hand loading, development was started in several directions to gain room territory, and in a few years miles of track were required to reach all points of coal production. In mechanical mining production is secured from a relatively small area and where multiple shift operation can be used the active territory required to produce the daily tonnage is further reduced. In the mine plans the coal reserves are frequently considered as a series of store houses such that when one is depleted it can be sealed off, and with the opening of the next there is a new underground mine every few years rather than a large area of worked over territory to be maintained.

Planning Now Includes Many New Features

With the change in methods of sinking slopes, such as the use of a loading machine to place broken rock onto drag conveyors for elevation to the surface, or in shorter slopes the use of the shuttle car lowered and hoisted by a small electric hoist, and improvements in belts to the point that a single drive unit placed at the surface will handle large tonnage from greater depths, main slope belts are gaining favor over balanced hoisting.

The state laws, Federal Inspection Service, and labor relations are having a greater influence on the final decision as to mining plan and equipment installed. The sales departments of the coal companies are occupying an increasingly important place in the council that determines the overall plan of the new property. The engineering and operating departments are devoting more attention to the details of mine projection, including the ventilation system, mining system, and selection of the mining equipment to secure some predetermined, overall result from the excavating, transportation, and milling program.

The thick seams do not seriously restrict the design of mobile equipment, and through the years highly efficient universal cutting machines, power drills, and loading machines have been developed to operate directly on mine track. In this bracket of mines, track mounted equipment, large mine cars, and electric locomotives offer real competition to other types of mine equipment. The large number of mines in the high seams that have selected off track equipment indicate that even here, track equipment has difficulty in maintaining its position.

The thin seams, with a full line of shortwall and universal cutting machines, power drills, loading machines, and haulage units to operate directly on the mine floor, together with duckbill equipped shaking conveyors, and flight conveyors, mine track and mine cars are being crowded out of the production territory, and in many cases off the mainline haulage in favor of conveyor belts that often carry the coal from the room territory, over the mainline, up the slope to the preparation plant.

New permissible powders, cardox, and the use of compressed air for preparing the coal for mechanical loading are an important factor in the success of mechanical mines.

Resume of Coal Mining Progress

In 1923 the first major step toward mechanization was taken when mobile loaders were introduced. Through the years machinery has replaced one hand operation after another as equipment has been developed capable of performing under almost any seam conditions. There are machines for cutting, machines for drilling, improved means of breaking down coal, machines for timbering, conveyors or shuttle cars for gathering, and rubber belts for transportation to the mechanical preparation plant. Important problems remain to be solved, but with the equipment available or projected, and experience in its use, coal production is approaching complete mechanization.

Coal loaded at face by duckbill and transferred to entry by shaker conveyor is discharged into a car or onto a belt. Proper anchorage and roof support is important

Trends In STRIP COAL Mining

Large draglines are used in stripping deep overburden and churn drills are being used to prepare hard rock for blasting

Increased Coal Production Demands Have Necessitated An Expanded Strip Mining Program—Quantity of Overburden Removed per Ton of Coal Has Increased Substantially

By R. H. SWALLOW
Ayrshire Collieries Corporation

IN the United States, the past year has been outstanding in the production of coal from strip mining. From all parts of the country, reports indicate that tonnage production from this type of mining is greater than at any time in previous history.

One factor, responsible in part for this increase, has been the development of small dragline and shovel pits to augment the production of large deep and strip mines. The raw tonnage from these small strip pits is loaded and trucked to the main preparation plant, where it is mixed with the run-of-mine feed of the parent mine, before being conveyed in to the cleaning plants. Most of these small pits use shovels, draglines, tractors, trucks, etc., which were previously in use on war plant construction.

Large Equipment in Use

Development of large stripping equipment has progressed, even though the war emergency has curtailed materials to a great extent. Several large draglines have been placed in operation this past year and have proved very successful for deep overburden stripping. In the anthracite field in Pennsylvania, it is expected that stripping will be carried to depths of 400 ft. by means of large dragline units equipped with 25-cu.-yd. dippers and 180-ft. booms. In the Midwestern bituminous field, two of these large dragline units are stripping very successfully in areas with a high ratio of overburden to coal.

The ratio, that is, cubic yards of overburden required to be moved to uncover one ton of coal, has steadily increased with both the economic demand for coal and the improvement in stripping equipment. Years ago, the rule of thumb was that ratios should not exceed 10 to 1, but during recent years some mines are now operating at ratios up to 20 to 1.

New "Wheel" Excavator

During the past several months in central Illinois, experimental tests have been made with a new type of wheel excavating machine. This unit is comprised of a rotating wheel, mounted on a retractable boom, with eight buckets which cut into the bank. As the wheel rotates, these buckets discharge their load onto a belt conveyor which carries the material out to the spoil pile, altogether a distance of approximately 300 ft. from the point of digging. So far, this machine has been operated only in tandem with a large stripping shovel

which digs the lower rock and hard shale, while the wheel excavator takes off the top softer material and deposits it behind the previous spoil bank made by the stripping shovel. Normally, in long straight cuts, a large stripping shovel can only spoil dirt from overburden in depths up to approximately 55 ft., so the wheel excavator may be useful in taking materials above this depth. As belt conveying is known to be a very economical means of transporting materials, the machine could show a very low cost per cubic yard for stripping overburden.

Re-handling Overburden

As has been indicated previously, the trend in strip mining has been toward recovering coal underlying deeper overburden, and to accomplish this end, a number of mining companies have developed methods of re-handling overburden. This is accomplished by placing booster draglines on the spoil banks to pull back the material so that the stripping shovel will have more dirt room. Naturally, this raises the overall cost per cubic yard, but it enables producers to strip through deep ridges in order to reach more favorable areas of coal which might occur beyond. Some small dragline operators have used tractors and bulldozers to help push overburden from the high wall which is increasing their production over and above the capacities of their stripping units. In still other cases, tractors and scoops have been used to haul overburden in order to increase production.

Preparation of Overburden

One of the most important features of stripping is thorough overburden preparation in order to save maintenance and repairs to the stripping machines. Drilling of the overburden is accomplished mainly by the following methods:

Side wall horizontal auger drilling for layers of rock lying several feet above the coal.

Use of rotary oil well type drills and churn drills for hard massive rock completely overlying the coal.

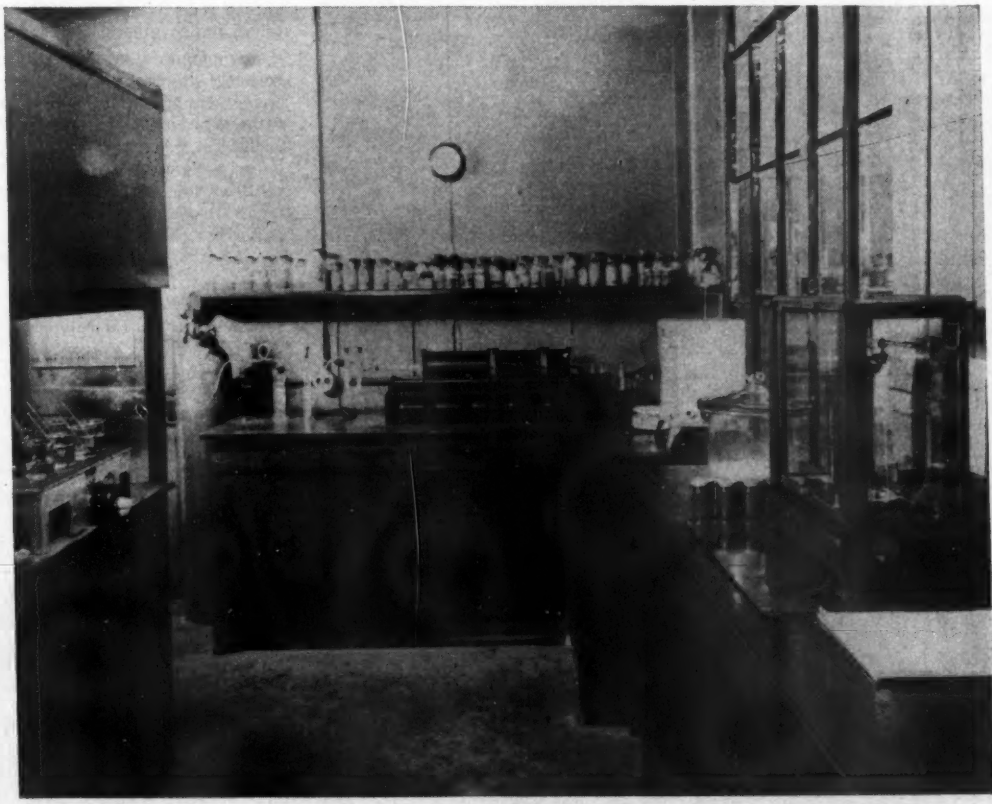
Vertical auger drilling for massive medium hard rock directly above the coal.

The last method is one of the later developments in drilling operations and proves very economical where it can be used. During the past year, extensive tests have been made with new kinds of alloy bits for use in hard rock on auger type drills.

Blasting is accomplished by both fixed explosives and liquid oxygen. Several years ago, the latter product was only available to those companies who owned and operated their own liquid oxygen plants, but now commercial manufacturers ship this evaporative liquid in thermos tank cars, and upon reaching its destination, it is pumped into thermos storage tanks at the mine property. It has been found that evaporation losses are surprisingly low in this method, due primarily to the careful construction of the storage tanks. The use of liquid oxygen is only warranted when continuous blasting is necessary, usually at large operations where hard rock conditions are encountered.

Good Truck Roads are Necessary

Truck haulage equipment has changed very little during the past year because of the tremendous requirements of the Army. However,



Careful preparation and drying of coal is only possible through cooperation between efficient laboratory control and operation

to alleviate costly maintenance and repairs, particular attention has been paid to maintaining good haulage roads. This, of course, means the extensive use of tractors, graders, and road maintainers. Some concerns have even set up small crushers to make road material from the rock product recovered from the overburden. In cases of long hauls to the preparation plant, combination truck and rail haulage systems have been installed.

Additional Attention to Coal Cleaning

Most strip mining companies have attempted to keep their preparation plants functioning at pre-war efficiency in order to insure post-war orders. During World War I, the tendency was to ship any kind of coal the traffic would bear, with the result that the coal industry suffered greatly during the depression years. Today, quality of product is the major consideration.

The number of new preparation plants constructed has been limited because of the shortage of critical materials. However, during the past year, several fine coal cleaning plants have been built, or are in the process of construction, as additions to existing plants. These plants are designed to recover coal from the slurry or sludge that previously had been wasted in the refuse piles or ponds. These plants rewash the materials ranging from ⅛-in. down to approximately 60-mesh (1/100-in.), taking out the fine dirt and dust, and in cases, recovering as much as 50 percent of clean coal out of the material formerly wasted. For example, a plant with a 4,000-ton daily capacity may recover as much as an additional 100 tons per day by means of fine coal cleaning, with very little additional power and labor. The greatest cost in strip mining is the drilling, blasting, uncovering and transportation of the coal, so that any additional recovery of the product at the preparation plant is a substantial and essential economic saving, aside from the increase in production provided.

Although few new developments in drying coal have been instituted recently, most plants with wet washing equipment have operated their driers, whether heat or centrifugal, to the fullest extent in order to maintain a low moisture analysis, thus giving a higher heat unit, as fired, to the finished product and making for more efficient combustion at the point of consumption. Naturally, the elimination of cars of frozen coal is vitally important, and the critical saving for our transportation in not hauling excess water is a pertinent factor.

Careful preparation and drying of coal is only possible through cooperation between efficient laboratory control and plant operation working in close conjunction with each other. Most of the larger companies maintain their own laboratories and chemists, while some of the smaller companies have working agreements with commercial testing laboratories. As the condition and quality of coal varies in different locations in the same seam, adjustments must be made in the mechanical operations of the preparation plants and this can only be efficiently done under the watchful eye of the qualified chemist.

Safety and Maintenance Problems

Most large strip mining companies using electrical equipment have installed, wherever possible, the four-wire ground protective method in their transmission system in order to avert electrical accidents. Although statistics are not available, reports indicate a great improvement in safety records as a result of this electrical improvement.

Experiments have been carried on recently in the use of tube electron converters to take the place of rotary type converters or motor gen-

A combination auger and churn drill has been developed to aid materially in prospect drilling

erator sets. To date, this has only been tried on small units, but the future may bring unusual developments in eliminating maintenance necessary on units that have moving parts.

All strip mines have diesel or gasoline tractors, trucks, shovels or draglines, etc., to a greater or lesser degree, so maintenance has been a major problem, as this type of equipment is so important to the Army. Spare parts are very difficult to obtain. As a result, ingenious means have been developed by the mechanics at the mine machine shops to rebuild these repairs so vitally necessary to keep up continuous production. Probably, one of the greatest factors in strip coal production has been the ability of the mine mechanics to "dope" out ways and means to keep machinery in running condition even with the shortage of labor.

Although the world conflict has eliminated choice in procuring the exact truck and tractor equipment desired, the trend recently has been toward the use of diesel engines whenever possible. Even though the initial investment is greater, the operating costs are generally lower.

Determining Coal Reserves—New Drill Developed

Prospect drilling for future coal is a procedure that must go on continually if mining companies are to stay in existence. A great percentage of strip coal prospecting has previously been done by hand or power churn drills, with an occasional auger drill being used to penetrate the upper softer materials. However, during the past year, a combination auger and churn drill has been developed to aid materially in this work.

Careful determination of coal thickness in prospecting is very important and the only real accurate methods have been either by diamond core or churn drilling. The vertical auger drill, because of its high speed, cuts into the coal before the operator is aware. Consequently, the combination drill was developed with the idea that the auger could bore the initial hole down to a depth of a few feet above the coal and then the churn tools could be attached to make an accurate determination of the coal thickness. In this work, an engineer usually makes a survey of elevation on the drill holes so that the drill operator will know about how far to drill with the auger before changing to the churn tools.

Another important feature of this combination drill is its usefulness when hard rock formations are encountered. In this case, when the auger will not cut the hard rock, the churn tools are attached with a heavy rock bit and drilling proceeds.

The design of this combination drill allows for drilling to depths of approximately 125 ft., which is ample for drilling areas in the Midwest where it has been used to date. However, it can be developed for greater depths where it might be necessary, such as the anthracite fields in Pennsylvania or in some of the Western states. It also should have uses for prospecting in other than coal mining, and in some cases, augers have already been used for prospecting clays and bauxites. Previously, churn drills had difficulty in starting holes in soft clay, sand and gravel formations because of caving action, whereas the auger handles this type of material easily, tending to pack the outside of the hole and thus preventing collapse of the side walls.

Because of the speed in augering, up to approximately a foot a minute, this method has been very helpful during the present labor shortage, and also shows a substantial saving in cost.

Strip Land Reclamation

A subject of prime interest to strip miners recently has been the reforestation and rehabilitation of spoil banks. For a number of years, certain companies have planted conifers and hardwoods on their properties with very good results, however, with no particular plan for future use of these trees. It was just a matter of planting to cover the bareness of the unsightly waste banks.

Strip mining organizations of several states have made plans and have given careful thought to this problem. For example, during the past year, the Indiana Coal Producers Association, which represents most of the strip mining operators in the state, organized a Division of Forestry and Reclamation and employed a Forestry Director, with the purpose of instituting a systematic method of spoil bank conservation. This comprises plans for growing pulpwood for paper mills, the planting of grasses and legumes for grazing, and the intelligent use of ponds and previously reforested areas for game and wild life refuges. Plans now call for surveys, maps and complete data records for all areas to be planted in the future. Pruning of trees as well as the sale of mine props and Christmas trees from areas already planted is anticipated.

Results of previous plantings indicate the species of trees most adaptable to the prevailing conditions, so plans are now being made to concentrate on these preferred types. Conifers are planted on approximately 6-ft. centers or about 1,200 trees per acre, while hardwoods, sycamores, cottonwoods, etc., are planted on 8-ft. centers or approximately 680 trees per acre. Grasses and legumes are planted by sowing the seeds, and walnuts are started by planting the nut itself.

In other states, some large strip mining companies have hired their own foresters to supervise and plan their conservation programs, feeling that highly economic advantages will result.

Statistics indicate that during the year 1943, anthracite, bituminous, and lignite strip mines in the United States produced approximately 85,000,000 net tons of coal or about 13 percent of the entire production of the country. No doubt when figures for 1944 are available, the above figures will be surpassed, and the strip mining industry can be proud of its achievements, even with reduced operating personnel and maintenance difficulties, characteristic during the present harassing war times.

The possibilities of spoil bank reforestation are exemplified in this 11-year growth of trees on a midwestern property

SALES OF Mechanical Loading and Cleaning EQUIPMENT—Coal Mines

By W. H. YOUNG
and
R. L. ANDERSON*

UNITS of underground mechanical-loading equipment sold in the United States for use in bituminous coal, anthracite and lignite mines were less in 1944 than in 1943; however, in terms of capacity the 1944 sales were 4.4 percent greater than in 1943.

Capacity of mechanical-cleaning equipment installed at bituminous mines was 55 percent more in 1944 than in 1943.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical loading and cleaning equipment in the United States, supplemented with data from various trade journals.

Mechanical loading of underground bituminous coal and lignite increased from 40.0 percent of the total output in 1942, to 42.3 percent in 1943, and 42.8 percent estimated in 1944. Mechanical cleaning of bituminous coal increased from 24.4 percent of the total output in 1942 to 24.7 percent in 1943. During 1944 it is estimated that 150,000,000 tons of cleaned coal were produced, or 24.2 percent of the total bituminous output. There are no mechanical-cleaning plants at lignite mines.

Underground mechanical loading in Pennsylvania anthracite mines decreased from 24.5 percent of the total output in 1942 to 24.3 and 22.8 percent in 1943 and 1944, respectively.

Table 1 shows bituminous-coal and lignite production by methods of mining and mechanical cleaning for the years 1942-44, inclusive. Pennsylvania anthracite production by methods of mining for the same years is given in Table 2.

* Messrs. Young and Anderson are chief and assistant chief, respectively, of the Bituminous Coal Section, Bureau of Mines, U. S. Department of the Interior. Printed with permission of the Director of the Bureau of Mines.

Mechanical Loading of Bituminous Coal, Anthracite and Lignite

Total units sold by type.—Units of mechanical-loading equipment sold for use in underground bituminous-coal, anthracite, and lignite mines, as reported by manufacturers for the years 1937-44, inclusive, are shown in Table 3.

Sales of mobile loaders increased from 234 in 1943, to 286 in 1944, or 22.2 percent.

There were 39 scraper units sold in 1944, this equals the number sold in 1940. This record of 39 sales has not been surpassed since 1933 when 65 units were sold.

Conveyor sales were 708 in 1944, compared with 1,100 in 1943, a decrease of 35.6 percent.

There were no pit-car loaders sold in 1944. During the past six years, 1939-44, inclusive, there were only 18 pit-car loaders sold.

Regional distribution of sales.—Table 4 shows the total number of units of mechanical-loading equipment shipped to the various states

TABLE 1. BITUMINOUS COAL AND LIGNITE PRODUCTION BY METHODS OF MINING AND MECHANICAL CLEANING, IN THE UNITED STATES, 1942-44, INCLUSIVE

	1942		1943		1944 *	
	Thousands of net tons	Percent of total	Thousands of net tons	Percent of total	Thousands of net tons	Percent of total
Surface stripping	67,203	11.5	79,685	13.5	95,000	15.3
Hand loaded underground	282,587	48.5	260,687	44.2	260,000	41.9
Mechanically loaded underground	232,903	40.0	249,805	42.3	265,000	42.8
Total production	582,693	100.0	590,177	100.0	620,000	100.0
Mechanically cleaned	142,187	24.4	145,576	24.7	150,000	24.2

* Preliminary.

TABLE 2. PENNSYLVANIA ANTHRACITE PRODUCTION BY METHODS OF MINING, 1942-44, INCLUSIVE

	1942		1943		1944 *	
	Thousands of net tons	Percent of total	Thousands of net tons	Percent of total	Thousands of net tons	Percent of total
Surface stripping	9,071	15.0	8,989	14.8	10,356	16.1
Culm banks and dredges	6,020	10.0	8,919	14.7	11,436	17.7
Hand loaded underground	30,495	50.5	27,990	46.2	27,938	43.4
Mechanically loaded underground	14,742	24.5	14,746	24.3	14,715	22.8
Total production	60,328	100.0	60,644	100.0	64,445	100.0

* Preliminary.

TABLE 3. UNITS OF MECHANICAL LOADING EQUIPMENT SOLD TO BITUMINOUS COAL, ANTHRACITE, AND LIGNITE MINES FOR UNDERGROUND USE IN THE UNITED STATES, AS REPORTED BY MANUFACTURERS, 1937-44, INCLUSIVE

	1937	1938	1939	1940	1941	1942	1943	1944	Percent change, 1944 from 1943
Type of equipment:									
Mobile loaders	292	241	292	233	368	352	234	286	+ 22.2
Scrapers *	29	10	26	39	11	29	15	39	+160.0
Conveyors †	1,095	990	1,311	1,762	2,130	1,491	1,100	708	— 35.6
Pit-car loaders	32	139	2	3	10	2	1	....	—100.0
Total, all types	1,448	1,380	1,631	2,037	2,519	1,874	1,350	1,033	— 23.5
Number of manufacturers reporting	28	29	31	32	32	28	24	22	.....

* Reported as scrapers or scraper haulers and hoists.

† Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads. Sales of both loading heads and shaker conveyors were counted for the years 1937-44, inclusive, but the figures for 1942-44, inclusive, do not include loading heads separately.

and regions during 1944. Types of equipment sold in approximate order of capacity are shown by letter symbol. For example, 160 mechanical-loading units were sold in Pennsylvania. In this total number of units sold, mobile-loading machines (indicated by "L") furnished the largest addition to capacity, followed by conveyors ("C") and scrapers ("S"). Capacities are based on actual performances as reported in 1943 by mine operators. In this aggregate of new equipment sold, mobile loaders furnished the greatest added capacity with conveyors and scrapers following in the order named.

A total of 882 mechanical-loading units were shipped to the bituminous-coal and lignite mines and 151 to Pennsylvania anthracite mines in 1944. In terms of capacity the sales of mechanical-loading equipment for bituminous and lignite mines increased 6 percent in 1944 over the previous year, while sales for use in anthracite mines decreased 35 percent during the same period.

In addition to the total of 1,033 units of mechanical-loading equipment sold for use in coal mines in the United States, a few units were shipped to foreign countries during 1944.

TABLE 4. TOTAL NUMBER OF UNITS OF MECHANIZED LOADING EQUIPMENT SHIPPED FOR USE IN EACH STATE OR REGION IN 1944

(L—Mobile loading machines; S—Scrapers; C—Conveyors)

State and region	Number of units of all types shipped in 1944	Types of equipment in approximate order of capacity in 1944
Northern Appalachian States:		
Pennsylvania	160	L.C.S.
Ohio	20	L.C.
Maryland	3	C.
Southern Appalachian States:		
West Virginia	262	L.C.S.
Virginia	31	L.C.S.
Kentucky	181	C.L.S.
Alabama	56	L.C.
Tennessee	44	C.L.
Middle Western States:		
Illinois	33	L.C.
Indiana	14	L.
Trans-Mississippi States:		
Arkansas, Oklahoma, and Missouri	16	C.L.S.
Colorado	18	C.L.
Montana and Utah	17	L. C.
New Mexico, North Dakota and Washington	11	L. C.
Wyoming	16	C.L.S.
Total bituminous and lignite	882	L.C.S.
Pennsylvania anthracite	151	C.L.S.
Grand total	1,033	L.C.S.

Types of machines sold compared with units in use in bituminous-coal and lignite mines.—The change in demand for different types of mechanical-loading equipment is shown in Table 5. The number of mobile loaders in active use increased from 657 in 1935, to 2,525 in 1943. During 1944 there were 282 mobile loaders sold or 11 percent of the total number in use in 1943.

Scraper units in use showed little change during the nine-year period, increasing from 78 in 1935, to 131 in 1939, and then decreasing to 83 in 1943. Sales of scraper units in 1944 amounted to 24 percent of the number in use in 1943.

Pit-car loaders are being rapidly replaced with other types of loading equipment. The number of pit-car loaders in use decreased from 2,098 in 1935, to 321 in 1943. There were no sales of pit-car loaders in 1944.

Conveyors equipped with duckbills or other self-loading heads increased from 179 units in active use in 1935, to 1,226 in 1943, and hand-loaded conveyors increased from 670 to 3,191 during the same period. There were 580 conveyor units sold in 1944, or 13 percent of the total number (hand-loaded and duckbills combined) in use in 1943.

Types of machines sold compared with units in use in Pennsylvania anthracite mines.—The change in demand for different types of mechanical-loading equipment for use in anthracite mines is also shown in Table 5. The number of scrapers in use at anthracite mines during the nine-year period 1935-43, has shown little change, varying from a low of 504 to a maximum of 547.

Conveyors in active use, hand-loaded and duckbills combined, increased from 1,563 in 1935, to 2,701 in 1943.

The total number of units sold in 1944 was 151, or 5 percent of the total in use in 1943.

Types of equipment purchased by regions.—Table 6 shows the number of mobile loaders, scrapers, and conveyor units shipped into the various states and groups of states in 1944

TABLE 5. SALES OF MECHANICAL LOADING EQUIPMENT IN 1944 COMPARED WITH TOTAL NUMBER OF MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use as reported by mine operators									Number of machines sold as reported by manufacturers in 1944
	1935	1936	1937	1938	1939	1940	1941	1942	1943	
Bituminous and lignite mines:										
Mobile loading machines	657	980	[1]	1,405	1,573	1,720	1,985	2,301	2,525	282
Scrapers	78	106	[1]	117	131	116	109	93	83	20
Pit-car loaders	2,098	1,851	[1]	1,392	873	697	607	481	321	...
Conveyors equipped with duckbills or other self-loading heads	179	234	[1]	346	559	656	788	1,062	1,226	[2]
Hand-loaded conveyors—number of units	670	936	[1]	1,526	1,834	2,263	2,807	3,041	3,191	[3] 580
Anthracite mines (Pennsylvania):										
Mobile loading machines	1	[3]	[4]	[4]	[4]	[3]	[3]	[3]	[3]	4
Scrapers	507	[3] 504	539	545	535	[3] 547	[3] 505	[3] 524	[3] 515	19
Pit-car loaders	22	[3]	[4]	[4]	[4]	[3]	[3]	[3]	[3]	...
Conveyors equipped with duckbills or other self-loading heads	30	[5]	[4]	[4]	[4]	[5]	[5]	[5]	[5]	[2]
Hand-loaded conveyors—number of units	1,563	[5] 1,790	[4] 1,855	[4] 1,831	[4] 1,997	[5] 2,189	[5] 2,432	[5] 2,491	[5] 2,701	[2] 128

[1] Data for 1937 not available for bituminous and lignite mines.
[2] Sales of conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.
[3] Mobile loading machines are included with scrapers.
[4] Mobile loading machines, pit-car loaders, and conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.
[5] Pit-car loaders and conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.

and the number of units in actual use in 1943. All of the mobile loaders except 4 were shipped to bituminous and lignite mines.

There were 39 scraper units sold in 1944, the bituminous received 20 and the anthracite 19. No scraper units were sold in 1944 for use in lignite mines.

Conveyor sales in 1944 in relation to the number in actual use in 1943 were greater in Kentucky than any other state.

West Virginia received 178, or 31 percent of the total number of conveyor units sold to bituminous coal and lignite mines in 1944.

Trackless gathering equipment.—Sales of rubber-tired, self-powered haulage units, or shuttle cars, increased in 1944 over 1943. Deliveries were made in 12 states in 1944 with Pennsylvania receiving the largest number and West Virginia, Illinois, Kentucky, and Tennessee following in order named. During 1943, 17 percent of the coal handled by mobile loaders was loaded into rubber-tired trucks and 3 percent was loaded onto conveyors for the initial phase of transportation. The balance of the mobile loader tonnage (80 percent) was loaded directly into mine cars.

TABLE 6. COMPARISON OF MOBILE LOADERS, SCRAPERS, AND CONVEYORS IN ACTUAL USE IN 1943 WITH SALES REPORTED IN 1944, BY STATES AND REGIONS

State and Region	Mobile loaders		Scrapers		Conveyors [1]	
	In use in 1943	Sales in 1944	In use in 1943	Sales in 1944	In use in 1943	Sales in 1944
Bituminous and Lignite Mines						
Northern Appalachian States:						
Pennsylvania	536	86	7	4	880	70
Maryland	...	...	...	..	27	3
Ohio	163	4	...	..	235	16
Michigan	...	...	...	..	5	...
Southern Appalachian States:						
Alabama	80	12	48	..	398	44
Kentucky	184	33	...	1	347	147
Tennessee	6	5	...	..	126	39
West Virginia	594	76	6	8	1,242	178
Virginia	47	9	...	3	134	19
Middle Western States:						
Illinois	567	29	...	..	31	4
Indiana	169	14	...	..	....	...
Trans-Mississippi States [2]	179	14	22	4	992	60
Total bituminous and lignite	2,525	282	83	20	4,417	580
Anthracite Mines						
Pennsylvania	[3]	4	[3] 515	19	[4] 2,701	128
Grand total	2,525	286	598	39	7,118	708

[1] Includes conveyors equipped with duckbills.
[2] Includes Arkansas, Colorado, Iowa, Missouri, Montana, New Mexico, North Dakota, Oklahoma, Utah, Washington, and Wyoming.
[3] Mobile loaders included with scrapers.
[4] Includes pit-car loaders and duckbills or other self-loading conveyors.

Mechanical Cleaning of Bituminous Coal

Sales of mechanical-cleaning equipment for bituminous coal.—Reports on sales from 17 manufacturers of bituminous-coal-cleaning equipment show that installations were made in 12 states in 1944 as compared with 10 states in 1943.

The total capacity of mechanical-cleaning equipment sold for use at bituminous-coal mines in 1944 was estimated at 5,400 net tons of cleaned coal per hour as compared with 3,500 net tons capacity sold in 1943. Some of this equipment sold in 1944 will not be placed in operation until early in 1945. In terms of capacity, about 60 percent of the installations were made at mines that had no cleaning facilities and the other 40 percent were made as additions to or replacement of equipment at mines that already had cleaning plants. Installations in 1944 were greater in West Virginia than in any other state.

COAL PREPARATION

By W. L. McMORRIS, Jr.
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GENERAL activity in coal preparation has been greatly accelerated by World War II. Actual installations during 1944 were few, however, in comparison to those for which plans are being laid.

Mechanized mining has increased by leaps and bounds as a result of manpower shortages. Operators, who are taking a long-range view of their markets, realize that, unless they sacrifice the advantages of mechanization during the post-war period, coal produced mechanically must be cleaned. The demand for coal of uniform high quality will supplant the present demand for coal and more coal.

Producers of metallurgical coal have attacked high-grade reserves at an alarming rate. The development of poorer quality coal reserves is already in progress. These coals will require cleaning and, in some cases, cleaning to a degree not now practiced. Each year steel producers are becoming more aware of the overall benefits in both quality and cost of finished products which result from raw materials of uniformly good quality, with no little emphasis laid on uniformity.

Mechanized Mining Has Increased the Need for Coal Cleaning Operations and Research is Pointing the Way to Further Improvements

Anthracite Preparation

In the preparation of anthracite coal, the recovery and utilization of finer sizes has continued to be one of the big problems. Increased pressure from the public has made it necessary to insure cleaner effluents from existing cleaning plants.

Where plants for the recovery of fine-mesh coal have been successful, the reworking of existing culm banks has added to the production so badly needed. Some small breakers have been installed for the sole purpose of recovering the fuel values in culm banks. Roughing plants for strip mines have been installed for primary preparation of the feed to central breakers.

Coal tables again led the field in new units, as well as in installed capacity. These were installed for sizes ranging from rice and barley down to No. 5 buckwheat.

The culmination of several years' exhaustive research is a Froth Flotation plant for the recovery of fuel values from silt, constructed by the Lehigh Navigation Coal Company, Inc. This plant is to be ready for operation in 1945. The high degree of efficiency afforded by Froth Flotation is of real interest. This type of cleaning may find more favor in the near future.

The following tabulation, which may not be complete, shows the coal cleaning equipment contracted for by Pennsylvania Anthracite producers during 1944.

Type of equipment	Number of units	App. total capacity
Coal tables	49	725 tph
Jigs	21	605 tph
Menzies Cones ..	8	320 tph
Hydrotators	4	120 tph

Advances in Bituminous Cleaning

In the bituminous field, Baum type jigs continue to lead the field in new capacity installed as they have done for several years past. The largest 1944 installation, having a capacity of 600 tons per hour, is located in West Virginia.

A combination plant using Baum jigs on the sizes 5-in. to 7/16-in. and coal washing tables on the 7/16-in. x 0 was installed in Alabama. This installation was ably described in the November, 1944 issue of THE MINING CONGRESS JOURNAL.

The calcium chloride washer has been one of the year's leaders in the number of units installed. These units of small individual capacity are being used primarily on stove and stoker sizes and were generally additions to existing preparation plants.

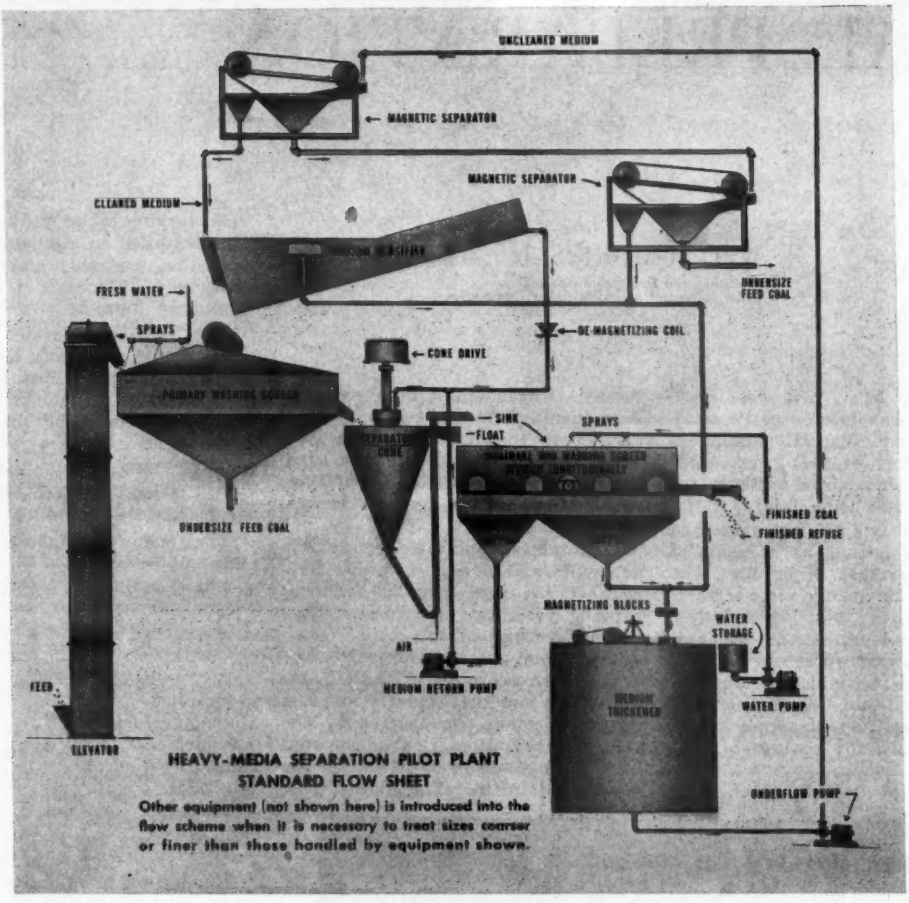
Air tables continued their popularity for the cleaning of ¼-in. x 0 sizes.

The following tabulation, which may not be complete, shows the coal cleaning equipment contracted for by bituminous coal producers in the United States during 1944.

Type of equipment	Number of units	App. total capacity
Baum jigs	11	1,950 tph
Calcium chloride.	7	365 tph
Launders	3	350 tph
Sand Flotation ..	2	318 tph
Air tables	5	230 tph
Diaphragm jigs..	1	185 tph
Wet tables	1	15 tph

In addition to this cleaning equipment, new tipples having an aggregate capacity of approximately 5,300 tons per hour were put under contract. These include hand-picking, crushing, sizing, etc.

Preparation of metallurgical coal for captive producers has occupied the design staffs of many of the large manufacturers and contractors. Plants are being designed which, when constructed, will be among the largest coal preparation installations in existence. In these designs, great stress is being laid on the necessity of large-scale blending either before or after cleaning and, in some instances, both ahead of and after the actual washing. During 1944, one of the larger producers of metallurgical coal let a contract for a coal-handling system from rotary dumps underground; through picking, screening, and crushing facilities; thence to an 18,000-ton blending bin for preparation of a uniform shipping product. This coal will later go to a new washing plant. Various methods of accurate blending have been advocated, including batch and continuous bin designs. A patented bed blending system which has proven successful on various ores may find a worthwhile field in the blending of coal where all of the pre-



A new adaptation of heavy media separation using finely ground (90 percent minus 325 mesh) magnetite is being given much deserved consideration as a coal cleaning process

vailing conditions warrant the installation.

Two new processes for cleaning coal have been given much deserved consideration during the past year. No commercial installations have been made in either case for coal preparation. These two processes have one thing in common. They have been used successfully on ores, but 1944 witnessed their introduction to coal in their modern form.

Heavy Media Separation

The first of these is a new adaptation of heavy media separation using finely ground magnetite. This process, now handled by the American Cyanamid Company, was first tested on coal many years ago. At that time, the heavy medium was finely-ground slate and clay from the coal seam itself. The first installation was operated by the Pittsburg-Midway Coal Company at Pittsburg, Kans., for some years. This process has come a long way since Mr. Wuerch made his first tests in a "single-handled pot" many years ago. Various media have been used—clay, gypsum, pyrite, galena, ferro-silicon, and magnetite. The latter two media are strongly magnetic and are readily recoverable from fine-mesh coal by means of magnetic concentrators. In the separating cone, the medium is a slurry of fine-mesh magnetite and water. Coal and refuse leaving the cone are drained over screens and the medium passing the screen is returned to the coal-cleaning circuit. Following the draining, the coal and refuse are sprayed to remove substantially all of the remaining medium. This portion of the medium, now too dilute for direct return to the circuit, is passed through a magnetizing coil which causes the fine particles to cling together in sufficient quantity to enhance rapid settling in a thickener. The overflow of the thickener provides the spray water. The underflow of the thickener is pumped to magnetic separators for cleaning. The magnetic product of the separators is then taken to a classifier or densifier to remove excess water. Leaving the densifier, the medium passes through a strong alternating current coil where the magnetic clinging together of the particles is broken up. Thus the medium returns to the separating cone again as a slurry. It is reported that, for separating gravities common in coal cleaning, the medium is ground to a fineness where 90 percent will pass through a 325-mesh screen.

The floating density, sinking density, and viscosity of medium all so important to any heavy media process are reported to be subject to close control. These factors may also be adjusted within fairly wide limits. Coal tests have been run on gravities as low as 1.25 and as high as 2.00. During 1945 more coals will be tested using this process. Actual installation of commercial size plants is a possibility if conditions of the times will permit.

Electro-Static Separation

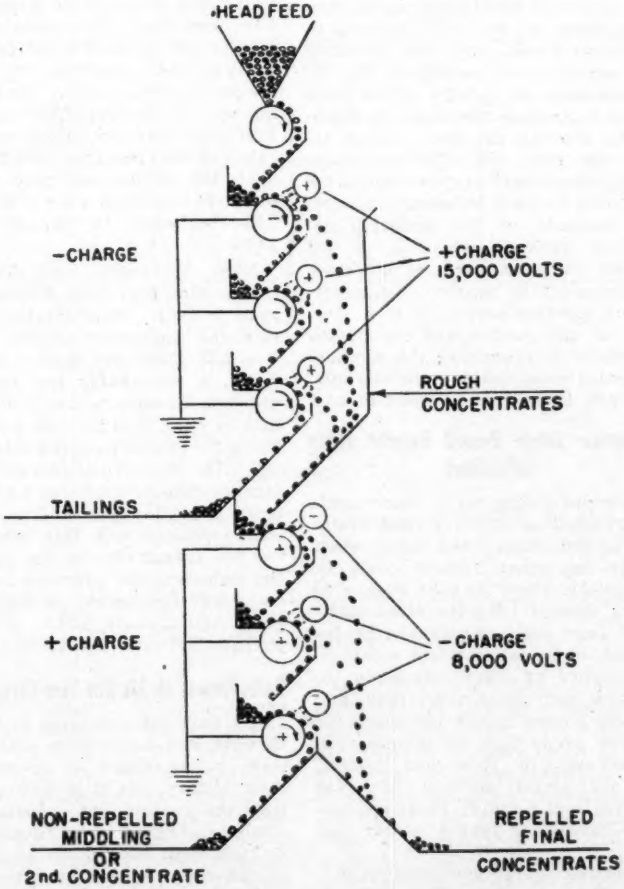
The second of the two processes to be tested for application to coal cleaning for the first time in 1944 is the "Johnson process." This process is electro-static separation. The separation of metallic minerals from gangue has been accomplished electro-statically for many years dating back before World War I. In the early years, the concept of the electro-static process limited its adaptation to the separation of conductors from non-conductors. In recent years, additional research work has developed an entirely new concept of electro-static susceptibility. Mineral tables published by the Ritter Products Company, the foster parent of the "Johnson process," show a wide variety of minerals and the electro-static behavior of each. It suffices here to say that the application of the newly-found principles of electro-static behavior of materials permits the separation of many more minerals than was ever thought possible.

The "Johnson process" is said to be applicable to the separation of coal in sizes ranging from 6-mesh to 100-mesh. The reactions of coal and its accompanying refuse are such that coal has been cleaned to an ash content approaching the irreducible minimum. The separation does not follow characteristic sink and float curves though the results have been checked by the sink and float method. Where some coals tested have separated to the complete satisfaction of the research engineers, others have proven exceedingly difficult. It is thought that the presence of finely divided pyrite may possibly prevent the separation which is possible on low-sulphur coals.

In coal cleaning, pre-drying is essential and the coal must be dedusted at about 100-mesh before cleaning. In operation, a thin stream of coal is fed to a conveying roll. As the coal passes over this roll, it is subjected to an electro-static field set-up between a charged electrode, which is parallel to and a few inches away from and above the conveying roll, and the grounded conveyor. The coal is fanned out with the finest mesh clean coal farthest from the conveying roll and the coarsest refuse nearest the conveying roll. An adjustable cutter is placed in the stream of falling coal, which diverts this fine-mesh cleaned coal to a chute leading to the clean-coal pocket. The balance of the coal is passed over a second conveying roll past another electrode and the operation continued. Several successive passes may be made in this manner with no change in either polarity or voltage. Second and third stages of multiple passes at changed voltages and/or polarity can follow to effect the final segregation of low-ash coal from high-ash reject.

This process can be used on a single mineral to effect a sizing. The finest mesh material is repelled farthest from the conveying roll and can be cut out. Each successive pass can cut out a slightly larger screen size by proper positioning of the adjustable cutters. Sizes produced can be made to closely approximate actual screening. Once cutters have been set to produce a given series of sizes, no further adjustment is required. This is true of final settings of the cutters in the coal-cleaning cycle.

Little is known as to the possible overall cost of this process for coal cleaning. When all of the factors are better known, the "Johnson process" may become a worthwhile tool in coal preparation. It is reported that plans are being laid for a pilot plant installation incorporating this process.



The "Johnson process" of electro-static separation is said to be applicable to the cleaning of coal in sizes ranging from 6 to 100 mesh

Outlook for Further Improvement

It is very significant that considerable time, effort, and money are being expended to exhaust the coal-cleaning possibilities of well known, as well as little known, equipment and methods which have proven successful in ore dressing. Coal operators are not alone in this venture. The manufacturers of the various coal-washing units which are so well known to the coal industry are doing their part and in many cases urging the operators to assist them in developing new and better methods for the preparation of coal. These same manufacturers are frequently better posted on the overall economy of coal preparation and marketing than most operators.

The needs of the coal operators for new and added coal-cleaning capacity may continue to take a back seat during 1945. Except in those cases where improved quality is of direct necessity to the war effort, priorities will be hard to secure for expanding preparation facilities. It is evident, however, that many coal producers are making the very best possible use of this period of curtailed expansion to prepare for the future.

SAFETY in the Mining Industry

Progress in Safety Has Been Made Despite Current Handicaps and Should Continue Strongly in the Future

By D. HARRINGTON
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THE American mining industry passed through by far its most nerve-wracking year in 1944. It was relieved of probably its most persistent foe over the years—lack of continuous all-year market; and although the demand for mining products exceeded supply in nearly all categories and with very few exceptions removed the many worries of the pre-war era due to slack work, numerous other problems, almost equally severe, came into being, and many of them affected the safety and health of those engaged in the industry.

Lack of manpower loomed high among these vicissitudes in 1944; this had numerous ramifications, which tended to complicate the efforts of both management and workers to provide maximum output of minerals for prosecution of the war and accomplish this result with at least reasonable consideration for the safety and health of those whose efforts made the production possible.

Need for Youth

The draft of mining employes into the armed forces, plus the departure of many for the more lucrative and, to some extent, more glamorous and less arduous war industries, largely denuded mines of the younger, more vigorous, yet well-trained men in 1941, 1942, and 1943; much of their work in and around mines was of a nature requiring youth, with the vim and vigor that goes with youth. To try to maintain or even to increase production, older and probably less-competent men undertook to handle the vacated jobs. These replacements, chiefly older men, worked at a disadvantage from the outset attempting to maintain the more nearly normal production of 1942 and 1943, but this difficulty was greatly increased with the much greater demand and expanded hours of work per day and days per week. The requirements in many cases strained or even exceeded the endurance of these oldsters. Much of the absenteeism of the past year was unquestionably due to this condition. When human beings work daily up to or even beyond their physical (or mental) capacity, accidents or ill health are almost certain to result in time; if over-worked (and overwork is very likely when underground workers in any age bracket over 50 toil every day), these men are likely to become absentees; if their places are filled with untried personnel (an expedient that had to be adopted to a considerable extent) accidents are likely to occur.

In addition to lack of manpower, employment of over-age workers or of inexperienced men, and absenteeism, many other conditions (to the disadvantage of safety) afflict those trying to produce the minerals essential to winning the war. These include the many difficulties in obtaining equipment and supplies needed for expansion to meet increasing production demands, or for replacing decreasing working personnel, or for keeping worn-out parts of machines or equipment in repair. The shortage of gasoline and tires is a vital cause of absenteeism and contributes materially to promoting the physical or mental breakdown of the workers, especially those over 50 years of age.

Impressive Safety Record Despite Many Difficulties

Notwithstanding all of these trials and tribulations of the United States mineral industries (and many other similar important factors could be mentioned), there is good reason to believe that in 1944 these industries (or at least coal mining) had by far the best, or lowest, accident record in this century at least. Moreover, in the three war years 1942, 1943, and 1944 the United States has made the greatest production of minerals in any consecutive three-year period, with the lowest accident rate (at least for coal mining) in any consecutive three-year period in our history.

Tentative figures now indicate that the coal output of the United States in 1944 totalled about 684,000,000 tons (the largest tonnage in any year), and in producing it, about 1,306 lives were lost. This gives a fatality rate of 1.91 persons killed per million tons of coal produced—by far the lowest, or best, fatality rate for coal mining in history; 1944 marks the first time that the coal-mine fatality rate has been less than 2.00 fatal accidents per million tons produced. The previous low rates were 2.22 in 1940, 2.23 (tentative) in 1943 and 2.30 in 1942.

Both anthracite and bituminous coal mining had their banner safety year in 1944. The tentative fatality rate for anthracite mining in 1944 was 2.72 killed per million tons produced, a remarkably low rate. The previous lowest rate was 3.57 in 1940, 3.58 in 1941, 3.80 in 1943 and 3.88 in 1942; for comparison, the rate in 1911 was 7.73. The bituminous coal mining fatality rate in 1944 was 1.81 (tentative) fatalities per million tons of coal produced and this also is by far the lowest rate in the history of the industry, the previous low rates being 2.07 (tentative) in 1943, 2.08 in 1941, and 2.14 in 1942. For comparison, the rate in 1911 was 4.82.

Rates Lower in All But Two Classifications

Not only did 1944 give to both anthracite and bituminous coal mining their safest years of operation in their history, but it is now apparent that the coal-mining industry as a whole established lower fatality rates in 1944 than in 1943 in all but two of the main causes of accidents in coal mines. The fatality rate in 1944 now appears to be lower than in

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1943 in the following: falls of roof and coal, haulage, explosions, explosives, electricity, shaft accidents, stripping or open-cut accidents and surface accidents. There were slight increases in the rate for machinery and in miscellaneous. The higher rate for machinery was probably due to the increased use of machines in mines as well as the employment of inexperienced men to operate them; the increase in miscellaneous is due chiefly to two mine-fire disasters, one with six and the other with 66 deaths.

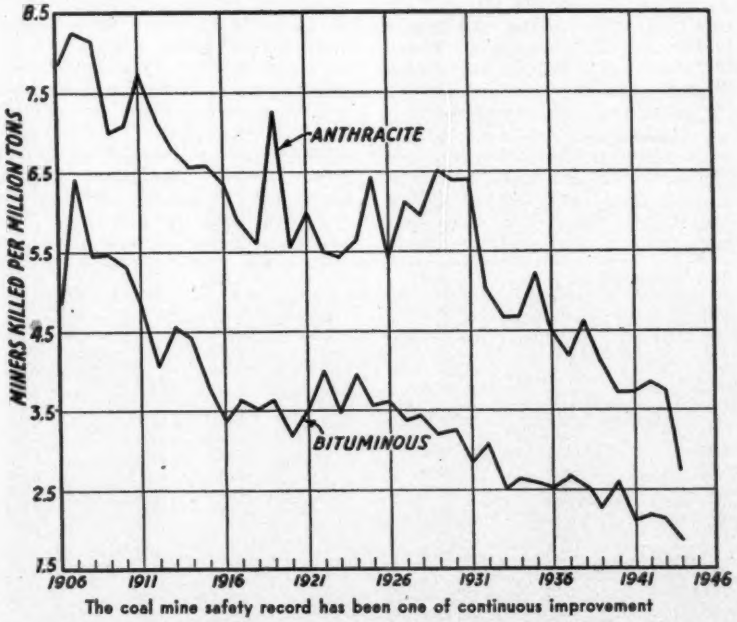
Comparison of World Wars I and II

For those who object to placing accident rates on a tonnage basis, the following information is presented. In this generation, the people of the United States have been confronted with two emergency periods demanding maximum production of coal—World War I and World War II; 1916, 1917, and 1918 of the period before and during the World War I had requirements similar to the three years 1942, 1943 and 1944. Production in 1916, 1917 and 1918 was, in round numbers, 1,920,000,000 tons, and this tonnage was obtained at a cost of 7,502 lives, a fatality rate of 3.91. Production in 1942, 1943 and 1944 aggregated, in round numbers, at least 1,970,000,000 tons (the exact figure is not available as this paper is written); this three-year output cost not more than 4,250 lives, the fatality rate being 2.15 deaths per million tons of coal produced. Incidentally, the production in these two three-year periods is the highest for any consecutive three years in the history of coal mining in the United States.

It will be noted that the people of the United States in their period of stress in World War II obtained 50,000,000 more tons of coal in three years than in three similar years of World War I; and this coal was produced at a loss of 3,250 fewer lives than in the previous war period. Hence, the vitally needed coal of the past three years was obtained at the sacrifice of approximately 1,100 fewer lives per year than a somewhat smaller output was obtained during World War I.

Mines Safer Than During World War I

Many factors entered into this very great reduction in loss of life (aggregating about 1,100 fewer deaths for each of the three years) in the course of obtaining a larger tonnage of coal the past three years than in the similar period of the previous war. A much larger tonnage of strip-pit coal is now available than during World War I; however, the quantity would have only a minor effect on the accident rate. Mechanized procedures underground doubtless enter into the matter, although there is good reason to think that, at least in some instances, their use is detrimental to safety. Steady work probably can be carried on with greater safety than intermittent work, but work in coal mines was no doubt as steady in World War I as in World War II. Unquestionably, coal-mining procedures and conditions in general are now far safer than in 1916, 1917 and 1918. Federal coal-mine inspectors are now in the field to aid state inspectors and mining people in trying to bring about greater safety in our coal mines, and the approximately 5,000 inspection reports on coal mines they have compiled in the past three years, with 50,000 to 100,000 of their recommendations put into effect, cannot fail to have had a definite influence on the fact that 1942, 1943 and 1944 have been three of the safest years in our coal-mining history.



The coal mine safety record has been one of continuous improvement

The Mine Safety Record Outside of Coal Mining

Definite information on safety in metal mining or non-coal mining in 1944 is not yet available and evidence as to what transpired is conflicting. Many non-coal-mining companies report that absenteeism, the substitution of inexperienced workers for experienced ones or the older men utilized to replace younger ones taken by the draft or the higher-paid war industries, inability to exercise the usual types of discipline, and other difficulties have caused the occurrence of accidents and accident rates to rise materially. On the other hand, some of the larger employing companies report greatly reduced accident occurrence with lower accident rates than in 1943 or 1942. It is hoped that, on the whole, non-coal mines have more or less paralleled the excellent accident prevention performance of coal mines in 1944, although it is doubtful whether all-time accident rates have been lowered, as in coal mining.

Major Mine Disasters

The year 1944 was relatively free of major disasters (those resulting in loss of five or more persons); none were reported in metal mines and four in coal mines (two from explosions and two from fires), the total fatalities being 94. The year 1944, however, had at least one ominous trend in that fires were far more than ordinarily prevalent in coal mines and on the surface at metal mines. Coal mining was very badly afflicted by underground fires, almost entirely of electrical origin; the trolley haulage system was usually the offender, and overheating of trailing cables caused far too many to bode well for the future. Two coal-mine

fires due to the trolley system caused the loss of 72 lives (6 in one and 66 in another), while one explosion resulting in loss of 16 lives occurred during the fighting of a fire caused by a trolley locomotive. These three serious fires caused by trolley systems occurred in three different states; and several other coal-mine fires in other states, which originated through the trolley system, narrowly escaped becoming major disasters.

Cause of the Coal Mine Fires

The "epidemic" of coal-mine fires in 1944 undoubtedly was due in large part to the abnormal effort to obtain maximum production for the war. Practically all of these fires of trolley-system origin occurred in highly mechanized, two- or three-shift mines having such a multiplicity of electrical equipment that, in several cases, circuit breakers could not (or at least did not) function as expected. These fires aroused much attention to the hazards of the trolley haulage system, inasmuch as bare trolley wires are now recognized as carrying a double threat for every linear foot of length—a contact electrocution hazard and a fire hazard. In addition, they have initiated numerous explosions due to ignition of gas or dust. Sober judgment indicates that the trolley-haulage system is too hazardous to be used in underground workings, and if Diesel locomotives of safe type can be manufactured (and there is good reason to think that they can), Diesel haulage should ultimately displace or replace trolley haulage.

Numerous fires occurred in surface structures at metal or non-coal mines, and in a few cases the fire extended into the underground workings; there were only a few fatalities although there were some narrow escapes. While loss of life was low, the dollars and cents loss in connection with these fires at non-coal-mine plants was high, and in some cases there was rather severe interruption of production of minerals or metals much needed for prosecution of the war.

Escape Openings

During the past year there were numerous incidents that happily resulted in no loss of life (or in the loss of relatively few lives) under conditions that might readily have been major disasters. In several cases considerable numbers of men were trapped in mines for several hours by floods, cave-ins, or fires but escaped. Several of these escapes were due to the fact that openings to the surface had been made relatively close to the face regions for ventilation and entrance or exit. Mines having working faces long distances (a mile or more) from openings to the surface should provide additional exit and ventilation openings relatively close to the working faces. Sometimes temporary entombments were caused by the fact that boundary pillars supposed to be left between mines were not in place as represented on mine maps or as required by state law or by the demands of safe mining procedure. This matter of defective mapping was brought to light not only when entombments occurred but also in connection with unexpected driving of mine openings into adjacent abandoned mines or even into parts of the same mine, causing intrusion of explosive or asphyxiating gases or water.

Explosives Accidents

In metal or other non-coal mines, both open-cut and underground, the year had its usual quota (probably somewhat larger than normal) of explosives accidents due to short fusing and drilling into bootleg or into missed holes, as well as other dangerous practices, and far too many persons were killed or maimed. As has been true for many years, much of the short fusing, or accidents from premature blasts, or from so-called racing fuse have been due to the far too prevalent idea among miners, that

UNITED STATES COAL-MINE FATALITY RATES
(Underground and Surface Accidents)

Year	Bituminous-coal mines per million tons mined	Anthracite mines per million tons mined	Total per million tons mined
1911	4.82	7.73	5.35
1912	4.04	7.12	4.53
1913	4.53	6.75	4.89
1914	4.40	6.55	4.78
1915	3.80	6.58	4.27
Average	4.31	6.95	4.76
1916	3.33	6.34	3.77
1917	3.83	5.84	4.14
1918	3.50	5.58	3.80
1919	3.62	7.21	4.19
1920	3.13	5.48	3.45
Average	3.48	6.07	3.86
1921	3.48	6.05	3.94
1922	3.99	5.49	4.16
1923	3.46	5.45	3.74
1924	3.94	5.64	4.20
1925	3.53	6.47	3.84
Average	3.67	5.80	3.96
1926	3.60	5.36	3.83
1927	3.36	6.11	3.73
1928	3.45	5.93	3.78
1929	3.19	6.53	3.59
1930	3.46	6.40	3.84
Average	3.42	6.04	3.75
1931	2.83	6.42	3.31
1932	3.09	4.99	3.36
1933	2.50	4.66	2.78
1934	2.67	4.69	2.94
1935	2.60	5.24	2.92
Average	2.73	5.23	3.06
1936	2.52	4.46	2.73
1937	2.68	4.15	2.83
1938	2.52	4.88	2.79
1939	2.19	4.11	2.41
1940	2.61	3.57	2.71
Average	2.51	4.23	2.70
1941	2.08	3.58	2.22
1942	2.14	3.88	2.30
1943	2.07*	3.80	2.23*
1944	1.81*	2.72*	1.91*

* Estimated.

Tabulated from Bureau of Mines Bulletin 462, "Coal-Mine Accidents in the United States: 1942," by W. W. Adams and L. E. Geyer, and earlier Bulletins 355, 319, and 275, by Mr. Adams.

blasting fuse burns at a rate of a foot a minute, when as a fact it burns at a rate of 30 to 40 or 45 seconds per foot. The foot-a-minute idea causes miners to cut fuse too short or to remain too long after having spit the fuse in several holes.

Electrical blasting is making considerable progress in non-coal mines and in time may reduce blasting hazards due to misuse of fuse; however, stray currents may present serious problems if electrical blasting is attempted in some types of metal mines.

Carelessness in handling explosives in coal mines under the stress of trying to obtain maximum production seems to result in leaving permissible explosives in railroad cars loaded with coal in an abnormal number of instances. In "running down" the causes of these occurrences, sabotage is usually suspected at first, but a rigid investigation usually reveals carelessness in sending explosives underground, storing them at the face preparatory to using, or disposing of the excess after the blasting holes have been charged.

Asphyxiations Numerous

The year had an unusual number of asphyxiations of people going into abandoned or unventilated mines or parts of mines, usually when they went down shafts. In two separate instances, four men were asphyxiated in going into shallow, abandoned coal mine shafts. In one case the men went down the shaft one at a time until four succumbed; in the other, four men went down together, three were killed, and one escaped, but in the rescue work a fourth man was killed. In some other cases one man or possibly two at a time were killed in mines (coal and non-coal) upon encountering asphyxiating gas, sometimes carbon monoxide but more frequently an atmosphere deficient in oxygen.

The Dust Hazard

During 1944, much interest was shown in suppressing or eliminating the dust hazard, both as to the prevention of explosions and as to controlling dust disease or in trying to alleviate the effects of breathing dust. It is probable that for the first time in the history of the mining industry, air dustiness was given more attention in anthracite and bituminous coal mines than in metal mines, even though much dust-prevention activity continues in metal mines also. In other words, dust disease is now recognized as a menace in coal as well as metal mines. Some far-sighted companies operating in nonsiliceous rock and ore are now taking minute precautions against air dustiness, thereby recognizing the hazards of nonsiliceous, incombustible dusts. In coal mining, dust prevention took the form largely of equipping cutting and loading machines with sprays and other water-distributing devices either with or without the intervention of wetting agents, and using tanks in some cases and water pipe lines in others. In non-coal mining, dust-prevention activities of the past several years (ventilation, water sprays, use of wet drills, etc.) were continued, and considerable experimenting was done on the use of diamond drilling of blasting holes, some of the holes being many times the usual length (in fact the feasible length) of holes by compressed-air drilling procedures. It now appears possible that with the probable advent of relatively lightweight diamond drills (preferable electrically driven), the dust hazard from drilling blasting holes in hard rock will be practically eliminated in at least some types of mining operations.

Progress Definitely on the Way

The over-all picture in health and safety in mining (both coal and noncoal) in the United States in 1944 is one of outstanding accomplishment and of hope for the future. "What man has done man may do" is a saying that can be applied to mining health and safety. The trends are chiefly those with promise of not only equaling what was accomplished in 1944 but of greatly exceeding the 1944 performance; and one can confidently predict that health and safety in mining in the years immediately ahead as well as in the more distant future, will be much improved over those of the past. In other words, progress in health and safety in mining is now definitely on its way.

Classes in mine safety and first aid form a basis for constant review and improvement in the well-being of all engaged in mining

"War Work" By Mining Machinery Manufacturers

By H. V. BROWN
President, The Brown-Fayro Company
Chairman, Manufacturers Division
American Mining Congress

IN THE early phases of World War II a great deal of pressure was brought to bear on manufacturers of mining machinery to "convert to war work," and many good arguments were used; particularly that there would be no question of securing necessary materials, whereas there was then no assurance of materials for continuance of the manufacture of even the most essential civilian requirements.

As a result a great many mining machinery manufacturers took on war contracts or sub-contracts, which were usually greatly increased in quantity and scope, with the result that it was not long before these manufacturers found their schedules of regular lines of production extended to an unreasonable degree. That situation still exists and has been detrimental to the best interests of the mining industry because it is not unusual today to find that certain critical items of mining equipment cannot be secured for 12 to 18 months.

The importance of full capacity production of standard types of mining equipment is now fully appreciated as the best contribution to the war effort that can be made by the manufacturers of specialized equipment for mines

The mines of the United States produced record tonnages in 1944, especially of bituminous coal which surpassed all previous records with a total production of about 620,000,000 tons. Despite all this, stocks at the end of the year were at a critical low, and the demand for 1945 is for even greater tonnages. Manpower is the principal limitation on maximum production at the mines: first, because of the shortage of experienced men; second, the fact that many workers have reached the age where they are unable to do the heavy work required for a six-day week, which is the present schedule for practically all mines.

The relief for this condition is further mechanization in every way possible of heavy burdens, such as hand loading, thus increasing the "tons per man." Through close cooperation of the mine operators and the manufacturers of mining machinery, it was possible in 1944 to make substantial progress in mechanization, but much remains to be done if the mines are to meet the demands of the military and the essential civilian requirements.

Late in 1941 it was recognized that unless the essential so-called civilian industries were given proper consideration in the overall planning, there could be no war production which must depend upon coal, steel and other metals; and the OPM established the Mining Division which, under the able direction of Dr. Wilbur A. Nelson, secured for the mining industry and manufacturers serving it, a fair share of necessary priorities on materials, labor, etc.

Mr. A. S. Knoizen, who succeeded Dr. Nelson as the head of this division late in 1942, continued and enlarged the good work of the division, and instituted a system of scheduling the important products of the various manufacturers so that these could be coordinated and made available in time to meet the requirements of the mines. This function of the division has been of extreme importance and must be continued to assure proper distribution of the available capacity of the mining machinery industry.

Production in 1944

The value of mining machinery and repair parts produced in the United States during 1944 was probably slightly under that of 1943, when the total production was $145,100,000, according to data released by the Mining Division, War Production Board, on October 16, 1944. It should be noted in passing that during 1944 the Mining Division insisted that special attention be given to orders for replacement parts, with the result that it is very probable that practically all mining equipment at the mines is now in as good operating condition as can be expected in view of its age and the heavy demands upon it for the last four years.

During 1944 the prime emphasis was upon the production of standard equipment; such as cutting and loading machines, drills, hoists, conveyors, shuttle cars, locomotives, mine cars, pumps, fans and other miscellaneous machinery required in everyday operation of the mines. There has been a continued increase in the use of shuttle cars in connection with trackless mining, and a decided trend toward large mine cars—many of them equipped with eight wheels—having capacities of 6 to 12 tons.

There was neither time nor engineering ability available for the development of many new products, but there has been continued improvement in the standard lines of equipment; such as the application of hydraulic controls on cutting and loading machines; hydraulic brakes on locomotives; the improvement of cutting machines in the form of conveyors to carry away the bug dust, thus eliminating considerable labor; improvements in conveyors, particularly along the lines of larger and longer belts; heavier types of chain conveyors, and fully automatic types of shakers and duck-bills.

Schedules for 1945 Indicate the Necessity of Continued Controls

The schedules of most mining machinery manufacturers are now heavily loaded for 1945, but it must be recognized that there will be insistent demands for additional production; not only for the mines of the United States and Canada, but to supply the needs of our Allies and the liberated countries. Much of the equipment in use today is in such condition that further repairs are not practicable or economical. This equipment must be replaced and in many cases such replacement orders have not yet been authorized. These orders will add to those on the manufacturers' books, and it will also be necessary to take care of the minimum requirements of our Allies and the liberated countries.

Preliminary estimates which have been made as to the requirements of our Allies, particularly the British Empire, Russia and the liberated countries, indicate a need for mining equipment to be delivered during 1945 in quantities that stagger the imagination. It is obvious that the mining machinery manufacturers of the United States cannot supply this volume of equipment, and it is therefore very essential that these requirements be scaled down to the very minimum. Even then most manufacturers will find it difficult to satisfy the demands on them and still maintain a reasonably satisfactory schedule of domestic deliveries. All this emphasizes the necessity for continuance of suitable controls and scheduling of the mining machinery industry, under the Mining Division of the War Production Board.

No War Profiteering in Mining Machinery

Price ceilings on mining equipment were established by the Office of Price Administration on the basis of prices applying in the latter part of 1941 and early 1942. As yet very few, if any, price increases have been authorized by OPA, but there have been instances of price reductions, particularly on machinery using certain standard types of electrical equipment.

On the other hand, many increases have crept into the cost of practically every product for various reasons. Plant operations have usually been less efficient since it has not been possible to carry through continuous production because of the difficulty of securing materials, etc. The use of substitute materials has often occasioned increased costs by reason of changes in manufacturing procedure. Labor costs have risen generally because of inefficiency and inexperience, in addition to premium pay for overtime in practically all plants.

These increased costs have been offset somewhat by greater volume of production, which has tended to reduce overheads, but this reduction has been more apparent than real because of the unusual overhead costs incident to the procurement of materials, the furnishing of detailed reports, schedules, etc. In view of continued pressure for increased wage rates and other benefits, and further increases here and there in material costs, it is apparent that the manufacturers are, or soon will be, in a critical position.

Implications of VE Day for the Manufacturer

Certain kinds of mining machinery, such as mine cars and locomotives, are ordinarily built to order because practically no two mines use the same type or size. Consequently it has been the practice that orders for such equipment are not subject to cancellation except on terms that indemnify the manufacturer. Other types of equipment, such as cutting machines, loading machines, drills, hoists, conveyors, shuttle cars, pumps, etc., are usually built in standard sizes with only slight changes necessary for voltage, track gauge, etc. In the past it has unfortunately been customary for mining companies to modify or even cancel orders for such equipment without thought of the effect on the manufacturer.

In this day of extended schedules it is important that due consideration be given, in placing orders for long term deliveries, to the possible effect of the termination of the war in Europe. Mining machinery manufacturers accepting such orders must in turn commit themselves for many items of material and component parts, including bearings, motors, castings, etc., which orders are usually subject to some cancellation charge: or the materials may be in the manufacturer's hands when a cancellation reaches him.

The Federal Government has made ample provision for an orderly procedure in the cancellation of war contracts, recognizing the costs involved therein, and providing means whereby the manufacturer may exercise certain options as to the disposition of excess inventory, etc. The mining machinery manufacturer is in substantially the same position as the war contractor in this respect, and certainly deserves equal consideration on the part of mine operators; particularly since, as indicated previously, he has been operating on a basis which has provided little, if any, profits to cushion the shock.

International News Photo.

Coal by the trainload, where needed throughout the land is made possible only through the most efficient mining operations backed up by the best possible mine machinery

COPPER Production

Manpower Losses Are Responsible for Decrease in Domestic Production—Imports Have Increased

By F. H. HAYES
Assistant Director, Copper Division
War Production Board

TOTAL refined copper production available to the United States in 1944 is estimated to be 1,782,100 short tons, which is only 2½ percent less than the record year of 1943. That the decrease was not greater is due to a higher rate of imports in 1944 than in 1943. Refined copper from domestic sources declined steadily during the last seven months, and mine production at the end of November was at a lower level than at any time since 1940. Manpower losses are entirely responsible for the decrease.

Demands for refined copper to meet military and essential civilian needs also declined appreciably during the last half of the year so that production was more than sufficient to cover them. However, this situation changed suddenly in the month of December due to increased demands for ammunition, and will be discussed further under Forecast for 1945.

Domestic Primary Production

Operating conditions in 1944 were worse than in 1943, because of a steadily decreasing working force. The demands of the armed services for young men were so great that deferments for men in the age bracket 18 through 25 years were cancelled and the furloughed soldiers in the same age groups were recalled to active service.

In addition to the men taken by the armed forces, labor was drained from mines and plants to other industries by inter-regional and intra-regional recruitment, and by voluntary migration.

Steps taken to obtain replacements included the employment of women in concentrators and shops and even in certain operations in open pit mines. The possibilities here are not exhausted although it is recognized that the field is limited to surface operations where heavy manual labor is not required. Inter-regional and intra-regional recruitment campaigns by some of the producers were successful only to a limited degree. Attempts to secure the services of Mexican nationals and other foreign workers failed except for arrangements to bring in less than 100 workers from Newfoundland for the Vermont Copper Company. Some 200 Puerto Ricans were transported from Puerto Rico to Utah by the Utah Copper Company during the summer, but this proved to be but a temporary source of supply. The use of Italian and German prisoners of war was investigated, but the prohibitions on their use extend to mining operations.

In general, the failure to obtain replacements for labor losses was due to the fact that other war industries known as the "must" programs held higher priorities for labor referrals.

At the end of November, the working forces in mines, mills, smelters and refineries had declined 22 percent from the first of the year, which included a loss of 60 percent of the furloughed soldiers. The tabulation below shows the distribution of the labor loss among different sections of the country.

Even though the declining rate of domestic production plus imports exceeded the requirements, the margin was not considered sufficient to justify a change in the War Production

LABOR STATISTICS, DOMESTIC MINES, MILLS, SMELTERS AND REFINERIES, NUMBER OF EMPLOYES ON PAYROLL, 1944

District	Jan. 1	Nov. 30	Loss Total	Loss Pct.
East	6,853	5,822	1,031	15.0
Lake	4,297	3,723	574	13.4
Northwest	21,786	16,781	5,005	23.0
Southwest	16,881	12,444	4,437	26.3
Total	49,817	38,770	11,047	22.2
Furloughed soldiers included above	3,453	1,390	2,063	59.7
Domestic Mine Production	**Jan.**	**Nov.**	**Loss**	**Pct.**
Tons of copper	89,925	71,951	17,974	20.0

DOMESTIC PRIMARY COPPER PRODUCTION
(Short tons of copper)

	Est. 1944	1943	1942
Open pit mines	562,500	591,747	545,414
Underground mines	432,100	512,875	543,175
Total	994,600	1,104,622	1,088,589

Production from open pits has increased from 50 percent of the total in 1942 to 56.6 percent in 1944.

Decreases in 1944 production from 1943:

Open pits, 4.9 percent with a labor loss at November 30 of 14 percent of employes on January 1.

Underground, 15.8 percent with a labor loss at November 30 of 35 percent of employes on January 1.

Premium price plan	Short tons of copper Est. 1944	1943	1942
Production on which no premium prices are paid	724,000	825,713	986,154
Production on which premium prices are paid	246,100	246,612	102,435
Production under RFC contracts	24,500	32,297	.....

Board policy of requesting maximum production with the available manpower from all operating properties. It was realized that if properties were allowed to shut down, the time, expense and labor necessary to reopen and resume production could delay the war program if unforeseen military demands for copper suddenly arose.

In an effort to maintain production with a diminishing labor supply, men were taken from development and maintenance work and put on production. This policy which has been followed now for three years has reached the point at some properties where developed ore reserves available for mining are so depleted that even the present production rate is threatened.

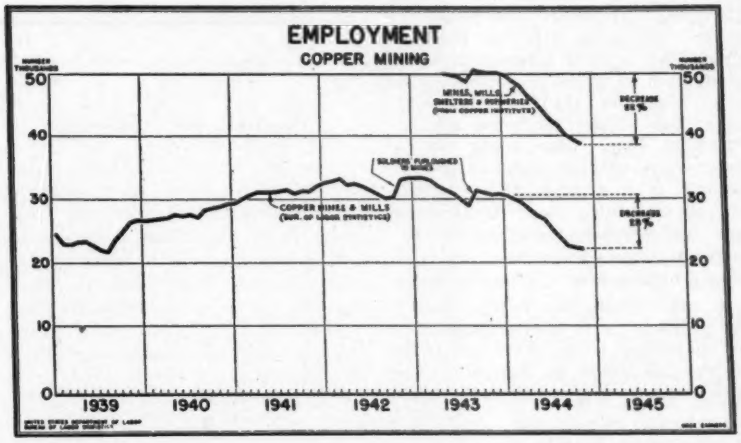
Refined copper production in 1944 from domestic ores exceeds mine or smelter production because inventories of materials in process have been reduced. The following tabulation indicates the difference:

DOMESTIC PRODUCTION—1944
SHORT TONS COPPER

	Refined Basis	Mine or Smelter Basis
1st quarter	281,600	290,800
2nd quarter	288,800	276,000
3rd quarter	273,500	251,800
4th quarter, est..	260,200	236,900
Year, est.....	1,104,100	1,055,500

Figures include secondaries.

No new projects for production were initiated during the year, and manpower shortages made it impossible to take full advantage of the increased facilities which were made available during 1943. However, at three of these projects, namely Castle Dome and Phelps Dodge-Morenci extension, in Arizona, and Quincy in Michigan, the 1944 increases in production were pronounced. These gains unfortunately were more than offset by losses from practically all other properties. The net result was a decrease of 10 percent below 1943 as illustrated by the table below.



Utah Copper Company has met the manpower shortage by placing as many women workers as possible at various jobs

Premium Price Plan Important

The Premium Price Plan continued to function throughout the year with no changes except that no new applications from producers for prices higher than 17 cents could be considered by the Quota Committee. However, there were a number of quota revisions in the Special Quota classification as well as in the basic "A" quotas. These were made necessary because of rising costs or decreased production or both.

It will be noted from the tabulation, above, that 724,000 tons or 72.8 percent of the production received no premium payments in 1944, compared with 74.7 percent in 1943 and 90 percent in 1942. It does not follow that 724,000 tons would have been produced at the 12c price if there had been no Premium Price Plan. Revised quotas are set in terms of tons of copper production which should receive the 12c price in order that the total production will receive the necessary price to cover estimated operating costs plus a margin. The basic "A" quota premium rate is set at 5c per pound for all over-quota production. For example, a property is estimated to produce 200 tons of copper per month for which a price of 14.5c per pound is necessary. This means that the quota would be set at 100 tons, thus:

100 tons copper @ 12c per pound
100 tons copper @ 17c per pound
200 tons @ 14.5c

The 100 tons of copper at the 12c price are included in the tabulation above as "Production on which no premium prices are paid." It is obvious that under conditions of a 12c price with no premiums, a number of these properties would shut down and other properties would curtail production to the high-grade ores on which a profit could be made at the 12c price. Therefore, the production at the 12c price with no Premium Price Plan is quite different from the production on which no premiums are paid. What the 1944 production would have been at the 12c price with no Premium Price Plan could not be determined without detailed examinations of a number of operations, but it certainly would total much less than 724,000 tons of copper.

The Premium Price Plan continues to be a vital part of the war program.

A small production in 1944, as in the previous year, came from domestic operations under RFC contracts. It was necessary to contract these operations as they were not eligible to come under the Premium Price Plan.

SUPPLY OF REFINED COPPER
(Short tons)

	Est. 1944	1943	1942
DOMESTIC:			
Refined from ores	1,038,100	1,116,500	1,072,000
Refined from scrap	66,000	90,000	70,000
Total domestic	1,104,100	1,206,500	1,142,000
FOREIGN—Imports	678,000	620,600	655,700
	1,782,100	1,827,100	1,797,700

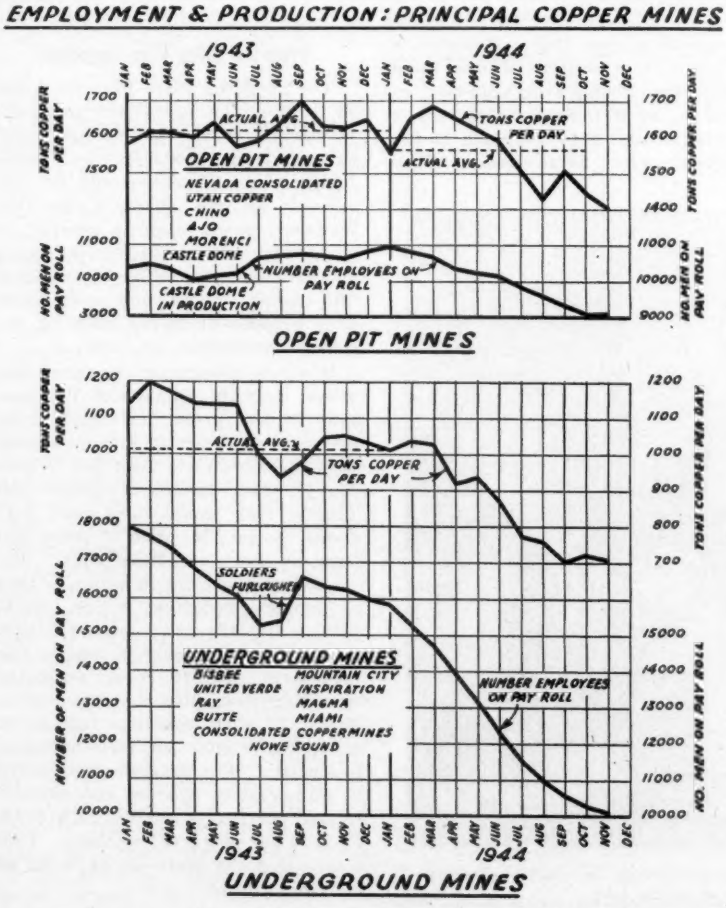
Foreign Primary Production

Foreign copper available to the United States came almost entirely from the Western Hemisphere. Chile, as in the previous year, furnishes the major part, followed in order by Canada, Mexico, Peru, Bolivia, Cuba, Ecuador and Newfoundland. Minor amounts were available from Cyprus and Turkey. There was an increase in 1944 of 11 percent over 1943 in the production available to this country, due primarily to Canadian copper. Labor conditions in the Latin American countries were somewhat unsettled during the year, and a general strike in Mexico during the summer curtailed production from that country.

One new production project—the Cananea open pit in Mexico — was completed during the last quarter and production should be up to rated capacity early in 1945, provided sufficient labor is available.

Imports into the United States, which is the significant figure rather than production so far as the war program is concerned, increased almost 12 percent over 1943. Most of these cargoes were water-borne and required tight scheduling of shipping facilities in a year which saw the European invasion and an increased tempo in the Pacific.

The tabulation shows imports and the total supply of refined copper during the last three years.



Scrap Copper

Supply and consumption of copper scrap were in balance in 1944. However, at the end of the year, it was becoming increasingly difficult to collect old scrap due to shortages in labor, gasoline and tires and inventories were decreased to the point where it may be necessary to substitute refined copper for scrap early in 1945. Fired cartridge cases from target ranges in this country and from European battlefields were used as fast as manpower and facilities could handle them.

In 1944, approximately 45 percent of the copper used by brass mills, copper wire mills, brass or bronze foundries and other processors came from secondary sources.

Copper Stockpile

Actual figures on the amount of the refined copper stockpile cannot be published in this article, but it may be said that production in 1944 more than satisfied the demands of military and essential civilian needs. This resulted in an addition to the

Metals Reserve refined copper stockpile, but it should also be noted that working inventories of refined copper in the hands of brass and wire mills and other processors decreased 20 percent from January 1 to November 30. Furthermore, stocks of ores and concentrates at smelters were reduced during the year so that 1945 should see refined and mine production more nearly in line.

During the latter part of the year, Congress passed the Surplus Property Act, which contained a provision freezing stockpile accumulations after the war. While the action taken is for a short period of time, it is helpful in indicating that further steps will be forthcoming to keep large amounts of copper from being dumped on the market after the war.

At at any rate, the stockpile of refined copper has not yet reached the safe reserve limit, so it would be dangerous to rely on stocks to compensate for current deficits in production.

Forecast for 1945

In December, 1944, Army requirements for small arms and artillery ammunition in 1945 were increased substantially. In order to meet all requirements of the war program, it will be necessary to increase copper production materially above the current mine production rate. Under present conditions of labor shortages, it will be impossible to get the requisite increase from domestic production. In fact, a recent survey of the principal producers indicates the need for some 4,000 additional workers in domestic mines, mills, smelters and refineries in order to maintain the present rate of 73,000 tons of copper per month. The reason is stated above, namely, the need for development and maintenance work.

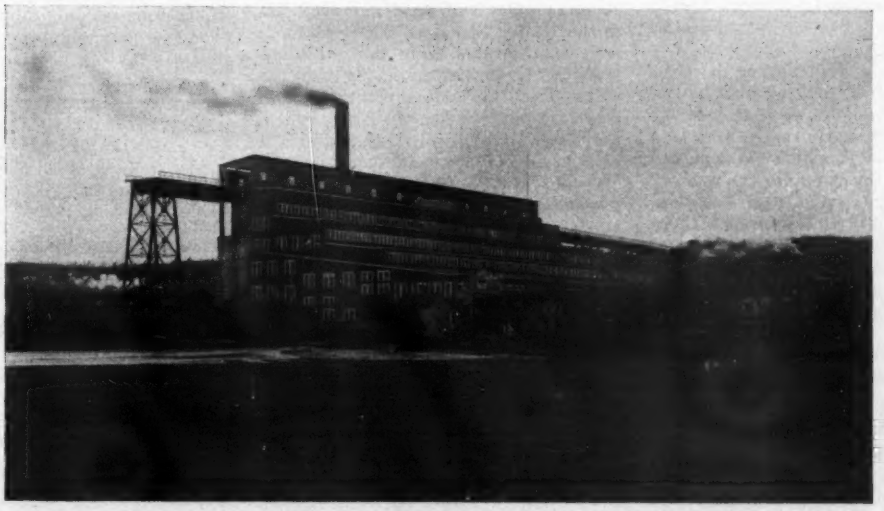
Women work in the mills too. Here they assist by keeping motors clean in the flotation plant at Garfield, Utah

However, increased imports can be obtained in 1945 from British sources of supply, Rhodesia, Belgian Congo and Canada, and such arrangements are being made.

Increased imports added to the present domestic rate of production will meet requirements for refined copper.

The various fabricating plants must increase working forces by some 5,900 workers in order to meet production schedules, and an intensive recruitment campaign is now in progress. The principal plants now have Production Urgency Ratings, and are classed as "Must" programs.

Copper is a critical metal, and it is vital to the war program for management and labor to give their "all out" efforts to halt the downward trend of domestic production, and increase the fabrication of copper.



The Ahmeek stamp mill treats the negative copper ore from the Ahmeek mine on the shore of Lake Superior in Northern Michigan

LEAD—

Government Stockpile Has Dropped to Less Than One Month's Supply and WPB Has Ordered Drastic Cuts in Certain Uses of Lead.

By F. E. WORMSER
Secretary and Treasurer
Lead Industries Association

EVER since last May the demand for lead has been so strong in the United States, and the available supply so inadequate, that the Government stockpile, fortunately accumulated at an earlier period, has been drawn upon heavily, month after month, to make up the deficit. The Government stockpile has fallen from a peak of 273,000 tons in 1943, to 90,000 tons at the beginning of 1945 (as reported by the Government) and is estimated to be 80,000 tons at the end of January, or less than one month's consumption. The expansion of the small arms ammunition program, after having been allowed to decline in 1944, has made matters worse. It was therefore quite obvious that before the year closed something would have to be done to alter this picture and to preserve the use of lead for military and essential civilian purposes. Hence, the War Production Board issued an amended Order M-38 on December 26, 1944, which drastically cut certain uses of lead.

The United States currently uses lead at the rate of about 92,000 tons per month and could use more if it were available. In other words, over a million tons of lead per year must be found to keep the lead consuming industries satisfied. From what sources can such a large supply be obtained?

Our thinking in wartime is completely different from what it normally is. Nowadays we estimate, as best we can, the requirements of lead to keep the war machine moving, and then search for possible sources of supply. In peacetime we make an altogether different approach, endeavoring to produce as much metal as possible and then doing our level best, through skilled sales promotion, to sell as much of the metal as possible.

Mine Production Curtailed

The largest single source of lead is the domestic lead mining industry, but lead mining has been affected so seriously by a shortage of labor that the total quantity of lead extracted from all producing mines in the United States has fallen sharply over the last few years and is now down to a rate of about 32,000 tons per month, whereas in 1942 the rate was 41,000 tons per month.

MINE PRODUCTION OF LEAD IN THE UNITED STATES *
(In short tons)

1940.....	457,000	
1941.....	461,000	
1942.....	496,000	
1943.....	446,000	
1944.....	417,000	(Estimated)

* U. S. Bureau of Mines. Includes lead in ore directly consumed in pigment production.

If we wish to look at the situation realistically we must come to the conclusion that, in the absence of relief from the labor shortage, we cannot very well expect much if any increase in the lead output of American mines, so that perhaps 400,000 tons of lead is all we may expect to receive in 1945 to meet overall requirements of almost 1,000,000 tons. We must, therefore, turn to the two other important sources of lead, (1) the collecting and smelting of secondary or scrap lead, and (2) lead from foreign lead mining countries in the form of pig lead or concentrates. Although there are currently ample lead smelting facilities in the United States so that additional lead concentrates from foreign countries can be treated here, the smelters and refiners are also shorthanded and lack trained personnel. Therefore, they are limited in their ability to handle an additional intake.

Scrap Collection and Conversion

Lead scrap collection and production has, likewise, been affected by the manpower shortage all along the line, from the initial collection of old storage battery plates at service stations and garages, the breaking up of the battery in the junk yard, its accumulation by the dealer and shipment to the smelter to its actual conversion into refined antimonial or soft pig lead at the smelter.

Secondary scrap is currently our most available "lead mine." Government authorities are well aware of this situation and are giving every consideration to means of helping to move more scrap to market. It is currently estimated by some authorities that 500,000 tons of scrap lead is scattered over the United States in the form of old scrap awaiting collection and conversion. It is a great pity that apparently nothing can be done, other than to provide necessary manpower, to procure and utilize this scrap in wartime. If we had only a fraction of the lead from this scrap currently all our supply troubles would be over. There would then be no need of the Government curtailing consumption in some industries so drastically, as for example, the important white lead industry, so that the very future of such an industry is at stake. I fear, however, it is not safe to count on much more than the 25,000 tons per month currently being produced from scrap, or about 300,000 tons a year.

RECOVERY OF LEAD FROM SECONDARY SOURCES *
(In short tons)

1939.....	169,000	
1940.....	194,000	
1941.....	353,000	
1942.....	284,000	
1943.....	303,000	
1944.....	298,000	(Estimated)

* U. S. Bureau of Mines.

Lead from Imports

Now, let us turn to the other possibility of increasing the lead supply namely, from imports. Mexico and Peru have been the chief source of foreign lead, but at times Australia and Canada have helped us out. For a time labor strikes and railroad

transportation difficulties seriously interfered with the movement of lead across the Rio Grande. Together with the diversion of some South American lead to Russia, these two forces partly accounted for the heavy drain on the Government lead stockpile last year. Australian and Canadian lead production has been seriously affected by labor shortages. As the Metals Reserve Company has just renewed its contract with Mexican producers at a higher price—equivalent to the ceiling price of 6.50c New York—we may look for continued transfer of the entire Mexican output to the United States. Peru may ship concentrates as well as pig lead. There is also a prospect that Argentine lead concentrates may come to the United States in 1945. But, it may be safe only to count on total imports from every direction of say 20,000 tons per month.

IMPORTS OF LEAD *
(In short tons)

Year	Pig lead	In ores and concentrates, etc.
1939..	7,000	80,000
1940..	152,000	131,000
1941..	274,000	107,000
1942..	369,000	123,000
1943..	243,000	70,000
1944..	220,000	90,000 (Estimated)

* A.B.M.S. and War Production Board.

The Lead Balance Sheet

To recapitulate, this is the way our balance sheet appears: We need about 90,000 tons of lead per month and have available from primary producers 32,000, scrap producers 30,000, imports 18,000 to 20,000 tons. A quick calculation shows that demand and prospective supply do not balance. The deficit of about 10,000 tons is the amount it is necessary to curtail the use of lead per month without drawing further on the Government stockpile.

Because it had gone through most of the war period without difficult supply problems, lead had come to be known as the one metal which was freely available and could therefore be used to replace scarcer metals and materials. The sudden change in the situation has taken many by surprise.

Importance in War

The important work which lead performs in wartime is not widely appreciated. To be sure, every one knows its use in small arms ammunition, but how many know of the large amounts that are necessary for the 100-octane aviation gasoline program which, together with civilian gas consumption used up over 80,000 tons of lead in 1944 and may require even more in 1945, or that lead has assumed the burden of supplying metals in the building trades when other non-ferrous and ferrous metals, have been unavailable. The scarcity of tin has caused a large demand to be made upon lead as an acceptable alternate, particularly in solders, bearing metals, and collapsible tubes for tooth paste and shaving cream. Undoubtedly this additional burden which lead has carried in recent years is one of the reasons for the current tightness in the metal.

In retrospect, it seems strange that only a short time ago some persons were seriously toying with the idea of closing lead mines to divert labor to the more necessary (in their opinion) copper, zinc and other metal mines. Today lead is in such demand that every prospect, every small mine and every large lead mine must continue to do its utmost to turn out the metal for the war effort. I believe that the war has given us many examples of the impracticability of expecting labor to move from one mining camp to another and that labor cannot be shuttled around as one would move mine equipment from operation to operation.

lead cannot be classified as either military or civilian and yet are indispensable in the war effort. A good example is the use of lead for covering telephone lines between metropolitan centers, or the use of lead pipe and sheet in the important chemical industry wherever sulphuric acid is used. An automobile employed solely for purposes of pleasure may be considered unessential but the same automobile when conveying war workers becomes essential. I believe we will be able to go through the war effort without too much attention becoming necessary to these difficult decisions, as only a comparatively modest reduction in overall lead consumption is required to bring the lead demand in balance with supply.

Cut in White Lead

One of the biggest cuts, I am sorry to report, is being made in white lead, an extremely important peacetime market for the lead miner. Unless some relief is quickly obtained in the form of more lead, there will not be sufficient lead available to keep the white lead plants in the United States

ESTIMATED CONSUMPTION OF LEAD *
(Including Antimonial Lead)
(In short tons)

	In Peace 1940	In War 1944
White lead	65,500	67,500
Tetraethyl lead	44,000	84,000
Red lead and litharge (a)	59,400	85,000
Storage batteries	220,200	292,500
Cable covering	107,400	122,000
Building (b)	65,000	74,000
Automobiles	11,000	7,500
Ammunition (c)	56,000	47,500
Coatings	6,000	5,500
Foil	23,500	15,000
Bearing metals	14,000	38,500
Solder	24,000	36,500
Type metal	16,800	22,000
Calking	19,200	33,000
Other uses	50,000	130,000 (d)
	782,000	1,060,500

* A.B.M.S. and Lead Industries Association.
(a) Exclusive of oxides for storage batteries.
(b) Includes lead used in chemical construction.
(c) Small arms ammunition consumed a total of 178,000 tons in 1943.
(d) Includes antimonial lead products, collapsible tubes, basic lead sulphate, steel and wire, brass, and other miscellaneous uses.

The problems of making savings in lead consumption are probably a bit tougher than for many other metals, primarily because lead touches so many articles needed in every-day existence. The public is seriously inconvenienced, directly or indirectly, when deprived of lead for storage batteries, in gasoline, in sheet lead and in other items. Many uses of running, even at a severely reduced rate, and many of them will have to shut down. Needless to say, the quality of paint supplied the American consumer will, likewise, probably be adversely affected. If not, there will be insufficient paint to go around.

Red lead will not be affected to the same extent as white lead because red lead goes into so many essential

Gold Hunter Mill at Mullan, Idaho. A 500-ton producer of lead-silver concentrates

uses such as the painting of ships, bridges and railroads. No doubt lead will have to use strong efforts after the war to recapture some of the civilian markets which it will lose by virtue of current restrictions.

The Postwar Future

An examination of the principal uses of lead discloses that the largest is storage batteries, the second largest cable covering, and, currently, the third largest the manufacture of tetraethyl lead. All are essentially noncompetitive outlets. Given a high rate of activity in the United States in the postwar period, these three industries alone may absorb most of the production of the American mines, leaving other large markets such as the manufacture of white lead, red lead, sheet lead, pipe, calking lead and various alloys still to be served. Indeed, so important has lead become in commerce that one can readily visualize a postwar market which will require the importation of lead in the form of ores and concentrates or pig lead, in greater amounts than we have ever experienced. The postwar future of lead appears particularly bright for the American lead miner.

AVERAGE PRICE OF LEAD—
New York (Cents per pound)

		"A" Quota	"B" Quota
1939.....	5.053		
1940.....	5.179		
1941.....	5.793		
1942.....	6.481	9.25*	....
1943.....	6.500	9.25	12.00†
1944.....	6.500	9.25	12.00

* Began Feb., 1942. † Began Feb., 1943.

Prices

Last summer the War Production Board disclosed the operations of its premium price plan affecting lead and indicated that the cost of the lead from American producers was 7.57c per lb. for the first six months of 1944. I have no more recent figures at my disposal, but I understand that the cost is even higher today, probably over 8.00c per lb. There is every prospect that the lead market and that of the other non-ferrous metals has been placed upon a permanently higher level. But in this war a violent upward movement of the lead market, such as permanently injured some of lead's outlets in the last war, has not, and is not likely to occur.

One may, therefore, assume that lead will continue to find a highly diversified outlet with certain new uses developed during the war becoming a permanent factor in industry. I refer particularly to use of lead-coated iron and steel products and use of high-lead bearing metals and solders. The role of these will, of course, be decided, as it should be, on the relationship between competitive performance and price.

In conclusion, I would urge all the lead miners to carry on, as I know they have been, with undiminished vigor, despite the harassment of an inadequate labor supply, and to use their utmost ingenuity in increasing production so that the important part which lead has already played in fighting the war will continue to the end.

Lead mining operations in southeastern Missouri contribute heavily to the Nation's supply of this important metal

ZINC—

War Program Indicates Heavier Calls for Zinc in 1945 in the Face of Reduced Labor Forces at Mines and Fabrication Plants

By ERNEST V. GENT
Secretary
American Zinc Institute, Inc.

IN 1944 slab zinc production continued at a high rate but did not equal the record output of the previous year or the somewhat lower 1942 figure. The less urgent demand, coupled with manpower problems, was primarily responsible. However, all military needs as well as essential civilian demands were filled, while stocks were increasing. This is not to say that all requirements for products with which zinc is identified were completely satisfied, but in no case was this due to a shortage of zinc. Some zinc-coated consumer products, for example, were unavailable because sufficient steel could not be spared.

With working inventories and stockpile reserves mounting, conservation restrictions were reduced to a minimum and in September the War Production Board discontinued allocating slab zinc, thereby permitting the industry to resume deliveries in the ordinary course of business.

Shipments Begin to Exceed Production

In the last quarter, shipments exceeded production and as the year ended, increases in the war program for ammunition brass and for galvanizing indicated heavier calls for zinc in 1945. Here again, the availability of manpower was looming as the governing factor in the production as well as in the use of zinc. To illustrate the difficulties in this connection, figures issued by the Bureau of Labor Statistics show that employment at lead and zinc mines decreased from 18,700 on January 1, to 14,600 on November 30.

The base ceiling price, as originally fixed by the Office of Price Administration, maintained throughout the year, namely, 8.25c per pound for prime western grade f.o.b. E. St. Louis.

Consumption figures released by the U. S. Bureau of Mines give a clear picture of past performance. In this respect, while the consumption of zinc in brass continued to exceed all other uses in 1944, it did not equal the record figure of 1943, although it may again be headed in that direction. Zinc in galvanizing, which because of restricted and prohibited uses fell off in succeeding years from the peak tonnage recorded in 1941, appeared to be rushing to equal that record. Zinc-base alloys and die castings made a slight gain in consumption, while rolled zinc products definitely moved upward.

Restrictions Lifted

There is not much left by way of substitution and conservation orders to restrict the use of zinc and its products. Material Substitutions and Supply List No. 14 was the final one to be issued and represented one of the closing acts of the Conservation Division of WPB which, having completed its function most creditably, was discontinued on November 2 at the request of the division itself. In List No. 14, zinc was transferred from Group II to Group III, representing materials which are in excess of current essential needs.

In spite of the comparative easiness of the zinc situation, the industry was alert to all the possibilities of the renewed intensity of the war effort. At the year's end it appeared that it would be advisable and perhaps necessary to continue indefinitely to encourage the utmost effort in domestic zinc mining and smelting operations not only for the zinc involved, but also to ensure the maximum output of cadmium and lead, particularly the latter metal, the supply of which became decidedly stringent in the late months.

Assuming the continuance of a high rate of consumption and the probability of some increase in the demand for slab zinc, it will no doubt be found necessary to supplement our domestic mine supplies with continued imports of concentrates if we are to balance requirements and maintain present inventory and stockpile reserves.

The most serious threat to the continuation of the well balanced zinc situation, which has so far been successfully sustained, lies in the manpower problem previously mentioned. More attention and practical assistance must be forthcoming from the manpower authorities if the industry, already badly handicapped by labor shortage, is to maintain present operating schedules.

Metal Production

According to Institute figures, slab zinc production in 1944 averaged 2,463 tons a day or a total of 901,330 tons, as compared with the record in the previous year of 2,663 tons daily and a total of 971,873 tons. October saw the lowest daily rate (2,219 tons) since January, 1941, which with the remaining months of the last quarter reflected the manpower shortage at smelters. While shipments in March (84,431 tons) reached an all-time record, total shipments were considerably below those of 1943, due mainly to the reduction in exports. However, domestic shipments were not drastically changed, totaling 835,797 tons as against 831,430 a year earlier. Stocks, which stood at 173,510 tons at January 1, increased to 232,105 tons at the end of the year, a substantial and welcome addition to working inventories and stockpile reserves.

Scheduled increases in consumption for the new year for ammunition brass and zinc-coated products for military needs mean additional slab zinc. Even though present smelting operations are maintained, this will necessitate drawing on reserve stocks. Should current production suffer, it would be real cause for concern. Manpower is the present bottleneck in the production picture.

Mine Production

The latest domestic mine production figures for 1944 are given herewith, together with similar figures for previous years.

With respect to operations in the Tri-State mining district, the following supplementary details may be of interest. Tri-State production has

particular significance, as in recent years it has been responsible for approximately 30 percent of the entire domestic mining production.

In this district, production was 355,943 tons of concentrates for the 52 weeks from January 8, 1944, to December 30, 1944, an average of approximately 6,800 tons per week. This represents a decrease of 20,770 tons, or 5.5 percent under 1943. For the first three quarters of 1944, production remained fairly consistent with the same period in 1943, but the last quarter production showed a decided decline. Maximum weekly production occurred during the week ending February 26, when 8,444 tons of concentrates were produced. Highest monthly production returns were established in March and July. Erratic winter weather, coupled with increased manpower shortage and truck tire shortage, all contributed to the drastic fourth quarter decline, which accounted for the reduced annual production.

The Joplin concentrate market remained constant at $55.28 due to the price freeze by OPA. However, premiums were still being paid by Metals Reserve Company for production in excess of quotas. Manpower shortages still remained critical throughout the industry. Transportation problems in the district were at a critical stage through lack of truck tire replacements. Over-all operating costs continued to increase, due primarily to decreased labor efficiency.

Net reserve stocks remained insignificant throughout the year, as nearly all production was sold and shipped as it was produced.

Production—A Credit to Mining Industry

Considering the labor shortage which was a major problem throughout the year, the total production achieved by domestic mines was truly remarkable and a credit to the resourcefulness of the mining industry. Unfortunately, the manpower difficulties were increasing at the end of the year and must be corrected if future production at these mines is to equal past performance.

To add to the miners' worries, the industry was warned that the shortage of heavy duty truck tires had become worse instead of better and that, for an indefinite period, tires of size 8.25 and larger would not be available. Because of the general use of motor trucks for ore and concentrate hauling and the increased development of rubber-tired haulage underground in the Tri-State district, the tire shortage is a serious matter in many mining operations.

Not much is allowed to be released with respect to imported concentrates, but obviously they were necessary throughout the year to supplement domestic supplies and substantial enough in volume to maintain smelters and pigment plants at the current high operating levels. Estimates mentioned by qualified speakers in the early part of the year at meetings in Denver, St. Louis and elsewhere indicated that somewhere between 330,000 and 450,000 tons of recoverable zinc in foreign concentrates would be needed to make up the gap between domestic mine production and metal and pigment output.

Premium Prices and Subsidy Payments

The premium price plan for over-quota mine production of zinc, which was originated in 1942 and expanded in 1943, continued unchanged throughout 1944, although there were constant rumors that modification and cancellation were imminent.

It will be remembered that in February, 1942, the original premium was fixed on the basis of 11c E. St. Louis for slab zinc against the ceiling price of 8.25c for prime western metal. This was termed the A premium when in February, 1943, two additional premiums were announced, B premium with a 13.75c base and C premium with a 16.5c base.

Early in 1944, James Douglas, then Director of the Zinc Division of WPB and now Deputy Vice Chairman for Metals and Minerals, termed as miraculous the job performed by the concentrate producers in the face of rising costs, labor shortages and natural exhaustion of reserves. Mr. Douglas credited the premium price plan with having played an exceedingly important part and announced that the average price paid for zinc to mines throughout the United States in the last quarter of 1943 was 10.74c per pound.

In November, 1944, Philip D. Wilson, Vice Chairman for Metals and Minerals, WPB, in an address before the International Mining Day Meeting at El Paso, Tex., stated that the average cost of zinc was 11c per pound which, it is understood, referred to the approximate average price paid to United States mines in the first half of 1944. In view of rumors of premium changes and cancellations, it is interesting to note that Mr. Wilson stated on the same occasion:

> The premium price plan as extended after its inauguration in 1942 provided that the basic A quotas would not be cancellable before July 31, 1945, unless the national emergency were declared at an end before that date. Later when the higher B and C premiums were instituted to give necessary relief to the higher cost mines and to stimulate greater production the right to cancel these B and C quotas and premiums upon 30 days' notice was expressly reserved. There has been much confusion in the minds of some people over this point and I feel that it should be clearly understood that this excessively high cost metal may be cancelled out with only one month's warning whenever it becomes entirely clear that it is no longer needed for the war. The War Production Board's responsibility under its charter from Congress is limited to the procurement of material to satisfy military and war supporting civilian requirements. It has no authority whatsoever to acquire metals or minerals for strategic or defense stockpiles for a future war, or for the purpose of conserving mineral resources or for other economic reasons. There is, therefore, no logical reason why the Government should continue to pay over 16 cents for zinc or 25 cents for copper when the time comes that there is sufficient metal available for war purposes at more reasonable prices. If that time should arrive before next July it is unlikely that the Government will adhere strictly to the 30-day cancellation privilege. A longer notice will most probably be given.
>
> It is only fair and just that the miner should be given ample warning, for he has made for the mining fraternity in this war a proud and enviable record of cooperation and accomplishment. . . .

The premiums referred to above benefit the miner only. The smelter does not share in these premiums in any way, nor is the consumer price affected.

In August, smelters were offered financial assistance to continue maximum production of zinc from concentrates originating in the Tri-State district. The official release went on to state:

TONS OF 2,000 LB. (Recoverable Zinc)

	1942	1943	1944*
Eastern States	199,809	197,053	178,098
Central States	258,181	221,759	215,721
Western States	310,035	321,856	320,162
Total United States	768,025	740,668	713,981

Source: U. S. Bureau of Mines.
* Preliminary—December estimated by A.Z.I.

Contracts providing subsidy payments to such zinc smelters are now in effect, WPB explained. The base price of Joplin concentrates f.o.b. mines or mills had been established at $55.28 per ton. Smelters later found the margin between this figure and the 8¼ cents per pound price of prime western metal decreasing to the point where handling of Joplin concentrates became unprofitable, WPB said.

Actual smelting costs have risen substantially during the last year and a half. Unavoidable upward revisions in the prices of coal, coke, gas and related supplies have contributed to the changing situation, industry members said. Labor shortages were stressed as another important factor in production cost increases.

Government Controls

During 1944, Washington controls with regard to zinc were relaxed for the greater part. The principal orders current at the end of the year include:

General Preference Order M-11 as amended September 15, 1944

This order relates only to slab zinc and by this latest amendment discontinued allocation certificates. In this connection it may be interesting to note that partial controls were initiated in April, 1941, through the operation of a reserve pool or "kitty." This system gave way to the introduction of allocation certificates and a complete channeling of slab zinc distribution through the hands of WPB commencing June 1, 1942. Producers and consumers are now permitted to do business, make shipments and accept deliveries in the normal manner. There is a provision in the current order which stipulates that persons accepting deliveries must not have an inventory in excess of a practicable working inventory. Monthly reports are still required from producers, dealers and consumers.

General Preference Order M-11-a as amended June 16, 1944

This order placed zinc oxide under control of WPB. More specifically, it controls deliveries of lead-free zinc oxide and restricts its uses. Monthly deliveries not exceeding 2 tons may be accepted without WPB authorization. Inventory of the purchaser must not exceed a 45-day supply. There are minor exceptions relating to deliveries to and by dealers, to Metals Reserve Company and for export. Other deliveries may be made only on specific authorization and in accordance with an authorization certificate issued by WPB. The use of lead-free zinc oxide is limited to a list of specific uses named in the order.

Leaded zinc oxide deliveries are not included in the scope of this order and therefore are not restricted by it.

General Preference Order M-11-l

This order covering zinc dust, as amended December 13, 1943, became effective January 1, 1944, and continued unchanged throughout the year. Deliveries which do not exceed 5 tons during the month are excepted. Other deliveries may be made only in accordance with an authorization certificate issued by WPB. Inventories are limited to a 45-day supply. Monthly reports are required from producers, dealers and users. Use restrictions are controlled by Conservation Order M-11-b and must be complied with.

Limitation Order M-353 as amended November 4, 1944

This order also bears the designation Part 3293—Chemicals. (General Preference Order M-128 previously dealing with zinc sulfide pigments was revoked June 6, 1944.)

The order includes, as a white pigment, zinc sulfide, which is defined as "any pigment containing more than 12 percent zinc sulfide. . . ." All commercial grades of lithopone are included.

The order establishes the inapplicability of certain preference ratings unless the purchaser furnishes a signed certificate to the effect that his purchase order is a "Preferred Or-

Zinc ore from a New Jersey Zinc Co. mine passes around on a picking table on its way to the crusher

der." Preferred Orders are defined as purchase orders rated under Preference Rating Order P-65, or under Preference Rating Order P-149 for coatings for interior linings only, or where deliveries are to be used or incorporated in material for the United States Army, Navy and other specified Government bureaus and agencies. It is also provided that rated orders without certificate may be filled as unrated orders to the extent permitted by Priorities Regulation No. 1.

Conservation Order M-11-b as amended October 11, 1944

The restrictions and prohibitions previously imposed with respect to the use of zinc and zinc products have been greatly modified by the current order.

Zinc and zinc products may not be used in the manufacture of articles on List A. There are 40 items listed, ranging from advertising novelties to burial vaults.

There are set forth in List B more than 40 items of articles and uses for which zinc and zinc products may be used with no restriction in so far as this order is concerned. *For articles on List B, other orders of WPB may limit production and this order does not remove any such limitation.*

For articles not on either A or B List, the use of zinc and zinc products is limited in any calendar quarter to no more than 20 percent of the amount used for the same purpose in the entire calendar year 1941, or at an 80 percent annual rate.

The usual exceptions are included regarding orders from Government departments and agencies.

The above is a limited summary and reference should be made to Conservation Order M-11-b for full details.

Consumption

Now that the monthly zinc consumption figures are released by the Bureau of Mines, we do not have to rely solely upon shipments from smelters to gauge consumption. It has already been mentioned elsewhere that while total smelter shipments in 1944 (842,735 tons) were lower than in 1943 (887,638 tons), domestic shipments in 1944 (835,797 tons) slightly exceeded such shipments in 1943. However, the following consumption figures give a much clearer picture of actual use.

Galvanizing operations, on the basis of final quarter figures and 1945 contemplated increases, seem to be moving rapidly toward the 1941 rate of 351,000 tons. Zinc in brass is also headed for higher figures and may well parallel 1943 consumption. Rolled zinc consumption rose when conservation measures were relaxed, but no further notable change is indicated at the moment. This is also generally true of zinc used in zinc alloys, which is hardly likely to change to any great extent until the production is increased of civilian products in which zinc alloy die castings are largely used—e.g., automobiles, etc., etc.

Stocks

According to the Institute's own figures, stocks at smelters stood at 232,105 tons at December 31. This includes the stocks held at smelters by Metals Reserve Company and the industry. A relatively unimportant tonnage held by a few secondary producers is not included, nor are the more significant stocks of imported metal which have not been officially disclosed. According to Bureau of Mines figures, stocks at consumers' plants in the period January-November, 1944, varied from a high of 86,510 tons at January 1, to a low of 62,625 tons at November 30.

Concentrate stocks on hand in this country, from both foreign and domestic sources, have not been released for publication. They are known to be substantial and from the present outlook are quite adequate, provided new supplies continue to flow uninterruptedly. At the risk of tiresome repetition, the manpower shortage is again emphasized as the weak link because it is already serious and threatens to become worse, rather than better, unless proper treatment is provided.

SLAB ZINC CONSUMPTION
(Tons of 2,000 lb.)

	1942	1943	1944*
Galvanizing	247,491	253,201	312,175
Brass products	319,946	419,079	366,665
Zinc-base alloys	80,145	76,325	84,115
Rolled zinc	66,045	48,529	75,705
Zinc oxide (French process)	7,977	11,496	21,824
Other	6,565	8,147	7,781
Total	728,169	816,777	868,265

Source: U. S. Bureau of Mines.
* Preliminary—December estimated by A.Z.I.

Stockpiling

WPB has worked closely with the industry toward the mutual objective of providing adequate working inventories of concentrates and metal. Apart from such inventories, postwar stockpiles came in for attention through the passage on October 3 of the Surplus Property Act of 1944. Interpretations vary somewhat, but it is believed that the War Production Board is required to recommend to Metals Reserve Company the tonnage considered necessary as a reserve or working inventory in the interests of war production plus the tonnage, if any, estimated as deficient in the civilian supply picture for a six months' period. Presumably, any excess on hand will be considered surplus and subject to immediate transfer to the Treasury Department as permanent war reserve stocks, as authorized under the Act of June 7, 1939. Within three months following the enactment of the Surplus Property Act, the Army and Navy Munitions Board is called upon to recommend to Congress the minimum and maximum amounts of each strategic mineral or metal which, in its opinion, should be held in the permanent stockpile.

Further interpretation and official determination must follow; but at the moment, at least, it would appear that any overabundance of zinc stocks should readily find a place in the nation's permanent stockpile.

Zinc—Postwar

Postwar conversion, when it comes, should not prove a major problem to the zinc industry, as the uses for zinc and its products follow much the same general pattern in war as in peacetime. Furthermore, a heavy demand is anticipated in the reconstruction period following the war.

Turning to the long-range viewpoint, it can be stated in all truth that zinc has contributed notably to the current war program and has come to be recognized as indispensable for the defense of the nation. Therefore, in dealing with the difficult problems which may eventually develop, it appears certain that measures can be counted upon to maintain the mining, smelting and manufacturing of zinc not only as a vital part of our postwar industry but also of our military security.

In any event, while the industry looks forward with eagerness and high hopes to the return of peace, it holds firm to the winning of the war as its first and prime objective.

LOWER PRODUCTION COSTS
with the right type of
HERCULES Permissible

Hercules FAST Permissibles

There are two types of Hercules Permissibles with a high rate of detonation—Collier C and Red H B. Wherever a smashing effect is desired, the Red H B is best suited. Where easier shooting is encountered, the higher count Collier C is oftentimes more economical.

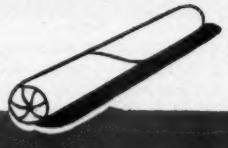
EXPLOSIVE	Approximate No. of 1¼" x 8" cartridges per 100 pounds
Collier C*	320
Red H* B	280

Hercules SLOW Permissibles

There are six Hercules Slow Permissibles, representing a wide range of cartridge strength and count, that are specially suited for coarse coal production. In cases where high cartridge strength is required the three Red H permissibles are suggested. The three Hercoals are widely used for coal that is more easily broken. In many applications Hercoals are replacing black powder and are giving highly satisfactory results.

EXPLOSIVE	Approximate No. of 1¼" x 8" cartridges per 100 pounds
Hercoal* F-1	500
Hercoal* D	450
Hercoal* C-1	400
Red H* F	356
Red H* D	316
Red H* C	276

Hercules GELATIN AND SEMI-GELATIN Permissibles



Both Hercogel A and Hercogel 2 are designed primarily for use under wet conditions. Hercogel A is a true gelatin permissible, and is highly water-resistant. Hercogel 2 is a semi-gelatin permissible that is more economical and perfectly satisfactory for most ordinary water conditions.

EXPLOSIVE	Approximate No. of 1¼" x 8" cartridges per 100 pounds
Hercogel* A (Gelatin)	200
Hercogel* 2 (Semi-gelatin)	240

*Reg. U. S. Pat. Off.

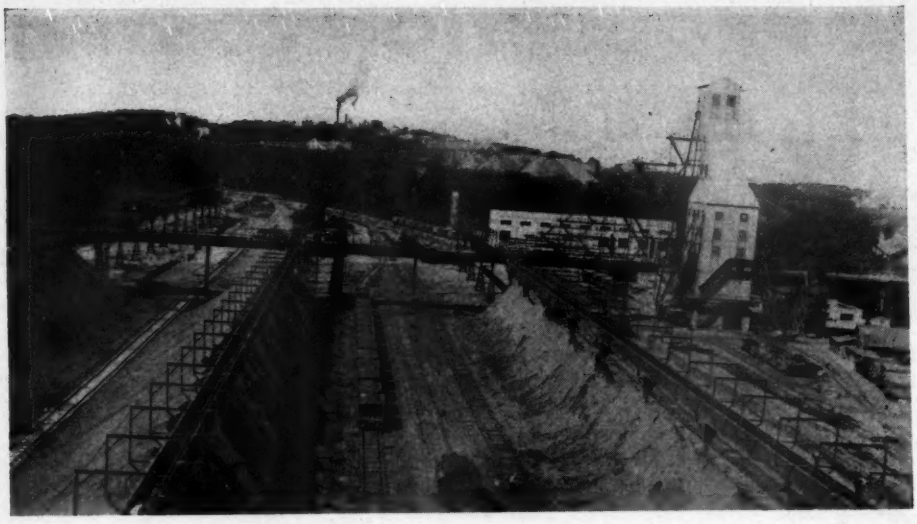
XP-51

EXPLOSIVES DEPARTMENT

HERCULES POWDER COMPANY

Incorporated

934 KING STREET, WILMINGTON 99, DELAWARE



Stockpiling facilities at the Montreal mine, Montreal, Wis., provide for various types of ore in a permanently built storage unit

IRON ORE—

By M. D. HARBAUGH
Vice President and Secretary
Lake Superior Iron Ore Association

Activity Still High Though Below '43—Optimism as to War's Outcome Caused Some Retardation in Production but with Change in Picture This Industry Shows Redetermination to Furnish all the Iron Ore the Country Needs

The ore fleets on the Great Lakes continue to handle a vast volume of the Nation's vital war traffic

TOTAL shipments of iron ore from mines in the United States in 1944 are estimated at about 96 million gross tons, compared to slightly more than 100 million in 1943 and nearly 107 million in 1942—the record year. The United States mines in the Lake Superior district shipped 80,674,930 tons by lake, plus approximately 1,200,000 tons all-rail. Lake shipments from Ontario mines, partly for United States consumption, were 495,608 tons. Table I shows the mine shipments by producing districts of the United States for the past three years. 1944 showed declines in the Lake Superior and southern districts and increases in the eastern and western districts.

Consumption of iron ore in all United States furnaces (based on incomplete data) is estimated at 100.4 million gross tons, compared to 101.1 million in 1943 and 99.1 million in 1942. Lake Superior ore consumed in 1944 is estimated at 84.8 million tons, compared to 86.6 million in 1943, and 83.7 in 1942. Imports included in consumption figures have been mostly Canadian since early in the war, although small tonnages have come in during the past two years from North Africa as ballast on ships returning from war deliveries, and some from Mexico for use in Texas. Over half the Michipicoten, Ontario, ore output moves to United States furnaces, and the remainder, plus ore from United States Lake Superior mines, supplies

Ontario furnaces, whose total consumption for 1944 is estimated at slightly more than 2.5 million tons.

At the beginning of the year it was generally anticipated that over-all ore requirements would at least equal those of 1943. Of the new blast furnaces in the nation-wide expansion program, seven had not then gone into blast, and there was then no thought that the year would see any drastic reduction in the war demands for steel. Following the Allied invasion of Europe in June and the rapid advance to the German border, the outlook gradually changed to such extent that even the military command voiced the thought that the war in that theater might end in 1944. Hence, as the ore shipping season advanced, there was considerable reason to feel that the tonnage needed to supply furnaces through the winter might be substantially less than was initially contemplated. At present the thinking as to the war's end in Europe has swung far in the other direction. A grim re-determination to carry on with whatever has to be done—for as long as need be—is now evident in this industry as in most others, with little time for comments and plans on postwar activities. Despite the change in the current war picture and in the outlook, there are ample supplies of ore on hand for furnace needs until the opening of the 1945 shipping season.

Scrap in Relation to Ore

Table 2 shows, for recent years, the interesting relationship between pig iron and steel production, and the consumption of pig iron and of scrap; and it reveals the extent to which the needed supply of scrap has been successfully maintained, despite frequently expressed fears that it might not be. The great expansion in pig iron producing capacity initially contemplated possible decline in the amount of scrap that might be available for steel making. In view of the fact that scrap consumption of more than 59 million net tons in 1941 was one-third greater than in the preceding year and nearly 60 percent more than in the five years ending with 1940, there was little reason to believe that, with further expanding production, steel furnaces could continue to receive their normal proportions of scrap. But the subsequent figures speak for themselves as to the scrap supply that has been available, and indicate why the demand for pig iron has not been quite as great as it might have been. Scrap and those who assemble and process it have played a vital role in the war effort. Scrap has conserved vast quantities of mineral raw materials that otherwise would have been required for war consumption; and by the same token, it is a factor to be taken fully into account by the iron ore and other mineral industries in estimating postwar demands for their products.

Steel production in 1944 is estimated at approximately 89.4 million net tons—an all-time record; pig iron production, at 62.5 million tons—also a record figure. Consumption of pig iron (and ferro-alloys) is estimated at 61.4 million tons, and consumption of ferrous scrap at almost exactly equal tonnage.

Steel-making capacity in the United States on July 1, 1944, as reported by the American Iron and Steel Institute, was 94,054,550 tons, divided as follows: open hearth, 82,604,600; bessemer, 6,074,000; electric, 5,372,150; and crucible, 3,800 net tons. This represents an increase of over 12,435,000 tons since the beginning of 1940 when total capacity was reported as 81,619,496 net tons. Pig iron and ferro-alloy capacity of blast furnaces on July 1, 1944 was reported as 68,446,310, compared to 55,723,640 net tons at the beginning of 1940, an expansion of over 12,722,000 tons. When it is realized that in 1940 the output of steel in the entire United Kingdom was but 15 million net tons, in Germany 28 million, in Russia 22 million, and in Japan 7 million tons, the magnitude and significance of the capacity increases in this country in the past five years—mostly in the past three years—can be appreciated.

TABLE 1—U. S. IRON ORE SHIPMENTS* BY PRODUCING DISTRICTS†

DISTRICT	1942 Gross Tons (Millions)	1942 Percent of Total	1943 Gross Tons (Millions)	1943 Percent of Total	1944‡ Gross Tons (Millions)	1944‡ Percent of Total
LAKE SUPERIOR						
Minnesota, Michigan and Wisconsin	93.01	87.10	85.98	85.85	81.9	85.2
SOUTHERN						
Alabama (and including Georgia, Virginia, Texas and Missouri).....	9.21	8.63	8.53	8.52	7.8	8.1
EASTERN						
New York, Pennsylvania and New Jersey.	3.08	2.88	3.19	3.18	3.6	3.8
WESTERN						
Wyoming, Utah, California, New Mexico (and incl. Arizona and Washington)	1.48	1.39	2.45	2.45	2.8	2.9
TOTAL.....	106.78	100.00	100.15	100.00	96.1	100.00

* Exclusive of by-product pyrite cinder and sinter from various sources.
† Sources: U. S. Bureau of Mines, Lake Superior Iron Ore Ass'n, and others.
‡ Estimated on December 1.

TABLE 2—STEEL, PIG IRON AND SCRAP STATISTICS OF THE U. S.†
(In Millions of Net Tons)

	Five-Year Average 1936-1940 Incl.	1940	1941	1942	1943	1944*
Steel Production ..... (Ingots and steel for castings)	52.3	67.0	82.8	86.0	88.9	89.4
Pig Iron Production... (Including Ferro-Alloys)	36.2	47.4	56.7	60.9	61.5	62.5
Pig Iron Consumption..	34.8	46.2	56.2	59.0	60.3	61.4
Ferrous Scrap						
Consumption Total ..	37.6	44.5	59.2	60.2	61.7	61.4
Purchased Scrap ..	17.5	19.5	25.3	27.1	26.6	26.1
Home Scrap	20.1	25.0	33.9	33.1	35.1	35.3

* Figures partly estimated.
† Source: American Iron and Steel Institute and U. S. Bureau of Mines.

The Lake Superior District

At the start of the 1944 lake ore shipping season, there was reason to believe that the Lake Superior iron ore movement would at least equal if not exceed that of 1943. Stocks on hand at United States and Canadian furnaces and Lake Erie docks on April 1 were 21.3 million tons compared to 25.1 million tons 12 months before, and ore consumption in the first quarter (at both United States and Canadian furnaces) was almost the same as in the first quarter of 1943. There was no intimation then that the European war might possibly reach a conclusion before the start of another shipping season.

The first ore was loaded on April 5 at Escanaba, and the first at the head of the lakes—at Two Harbors—on April 9. In the previous season, the corresponding dates were April 4 and April 24. Thus, the season got off to a good start, and 5.3 million tons were loaded in April compared to slightly under 2 million in April, 1943. Shipments in both May and June exceeded those in the same months of 1943. Thereafter, ore shipments declined month by month, ending the season with the last vessel loaded at Ashland November 28, and a total movement of 81,170,538 gross tons, compared to 84,404,852 tons the preceding year when the last vessel was loaded on December 6. All-rail shipments, in addition, were approximately 1,200,000 tons in 1944, compared to 2,016,160 tons in 1943.

Lake Traffic Problems

The maximum tonnage loaded at upper lake ports (United States and Canadian) in any month of the past season was 12,908,972 gross tons, in July, compared with the all-time record of 13,976,770 tons in August, 1943; and the maximum weekly loading was 3,053,553 gross tons in the week ended 7 a. m., July 17, as compared to the record of 3,258,328 tons in the week ended August 23, 1943.

All the new lake ore carriers built by the Maritime Commission were in service in 1944, the ore fleet at maximum containing 303 vessels of United States registry, with rated trip capacity of 2,940,090 gross tons; also 12 Canadian vessels were in the ore trade part of the season and carried 271,500 tons of ore.

The lakes continue to take toll of life and property in connection with the vast movement upon their waters of commodities vital to the commerce and industry of the country whether in war or peacetime. Two collisions in Lake Erie fog on April 27 caused the loss of two of the four vessels involved. The *James H. Reed*, an ore carrier with 7,500 tons aboard, went down with loss of 12 lives. The *Frank E. Vigor*, a self-unloader with 6,000 tons of sulphur, went down without loss of life.

With needs of the war services holding priority it is difficult to retain the high type of labor required in the mines

One of two vessels sunk by collision in fog in June, 1943, the *George M. Humphrey*, with an ore cargo of 14,000 tons, was raised during the year from its position in 80 ft. of water in the Straits of Mackinac. The job was a triumph of engineering skill, and not only was a valuable vessel salvaged, but more than half its ore cargo also.

General Statistics

Table 3 shows significant statistics of Lake Superior ore, both United States and Canadian, for the past few years (including shipments by lake and all-rail), consumption, and stocks at furnaces and Lake Erie docks on significant dates. Of the total 1944 lake shipments of 81,170,538 gross tons, Minnesota supplied 65,587,514 tons or 80.8 percent; Michigan and Wisconsin, 15,087,415 tons or 18.59 percent; Michipicoten district of Ontario, 479,197 tons or 0.59 per cent; and the new Steep Rock mine in the Atikokan district of Ontario, 16,411 tons or 0.02 percent. Of the Minnesota output, 20.5 million tons was shipped from the "big pit" (Hull-Rust, Mahoning, etc.) at Hibbing. Shipments from this pit—in the two major operations—reached a peak of 25.5 million tons in 1943, and in the past five years, 1940-1944, inclusive, amounted to more than 104 million tons — slightly exceeding combined shipments in the same period from all the five Lake Superior ranges other than the Mesaba. The importance of the contribution of this great open pit to the war effort is obvious, and the country can be eternally grateful that this pit and the other mines of the Lake Superior district were available as "going concerns," largely equipped and ready to meet the emergency that could not have been met without them.

Although not shown in Table 3, the stocks of Lake Superior ore on hand at United States and Canadian furnaces and at Lake Erie docks on December 1, 1944 (exclusive of some tonnage in transit) are estimated at 44.7 million gross tons, compared to 49.4 million tons on hand December 1, 1943. In view of the fact that the tempo of the war has been rising in fury, the outlook is for continued consumption of ore at or above recent rates, indicating that the stocks on April 1, 1945, would be reduced to approximately 16 million tons, if demand for about 7.2 million tons per month continues until then. This

would indicate an early opening of the 1945 shipping season as desirable to wholly insure supplies of the various grades of ore to maintain normal operations of all plants.

Loss in Labor Hampers Development and Activities

Despite the fact that the mine labor supply was insufficient in various parts of the Lake Superior district, mines somehow managed to get along, although continuing to neglect much development and other work in order to get out production. Approximately 24,000 persons were employed by the industry at the peak of the season, including (as in the previous two years) considerable numbers of temporary employes, i. e., teachers and students from local schools used in and about mines, shops, offices and laboratories during the vacation period. Of course, many thousands more are employed in the rail and lake transportation of ore and in furnishing supplies and equipment and various services to this industry. About 60 prospect drills have been active on all the ranges during each of the past three years.

War Labor Board Hearings

Following the demands by the CIO-United Steelworkers of America, for increased wages and various special benefits in the steel industry, this union made similar demands upon the ore mining companies early in the year. The War Labor Board appointed a special Iron Ore Panel, consisting of representatives of the union, the operators, and the public, to hear evidence in the case and to make recommendations to the Board. Hearings were held in Duluth and in Washington. The iron ore case, being subsidiary to the steel industry case, had not been decided by late December, although the WLB announced its decision in the "Steel case" November 27, denying the principal wage demands but granting certain so-called "inequity" increases and various special benefits which add up to substantially increased costs of operation.

As there have been no changes in the base prices (now OPA ceiling prices) of ore which were published in 1941 (i. e., $4.45 per gross ton for Mesaba non-bessemer, 51.5 percent Fe. etc.), any further increased costs, whether for labor or anything else, are of much concern to the Lake Superior iron ore industry. It is well known that the underground mines, which employ the most labor and contribute a substantial and significant proportion of the best grades of ore, are already reduced to a very small average margin of profit, which means that many are below the margin. The open pits which must beneficiate their output are also relatively large employers of labor and hence relatively higher cost operations. Direct-shipping open pit mines, which of course require the least labor per ton, are naturally less directly affected by increased labor costs, but they have other problems, particularly of large current expenditures for stripping and opening up additional reserves to replace the ore-bodies so rapidly depleted in recent years.

Iron Ore Beneficiation

Figures as to the tonnage of beneficiated product shipped in 1944 are not yet available, but the total is estimated to exceed 15 million tons, nearly 20 percent of all shipments, or about the same proportion as in the past few years. This includes concentrates produced by washing, jigging, heavy-medium separation, as well as sintered and dried ore. Since ore washing began in 1907, the total beneficiated product shipped from this district exceeds 208 million tons, over 11 percent of the total output. The proportion of such product is expected to continue to increase. Incidentally, the above figures by no means indicate all the tonnage of Lake Superior ore that is beneficiated before use, as large amounts of the fines are separated and sintered or nodulized in plants located at the consuming points; the tonnage so treated in 1944 is estimated at approximately 5.5 million gross tons.

It is evident from the war record of this industry that it has gone "all-out" for needed production, regardless of the economic consequences to it, taking its changes on replacing—through new development and new technology—the excessive depletion of reserves in its operating properties, and on recovering some margin of profit on its operations. Shipments from mines of the six United States ranges total nearly 406 million gross tons in the five years, 1940-1944, of preparedness for—and engagement in—the war thus far, whereas the shipments during the preceding ten years, 1930-1939, were but 320 million tons.

Research on "Taconite"

As is now generally known, the Lake Superior operators are busily engaged in various research activities attempting to develop the most practical and feasible means of producing suitable furnace feed from the abundant low-grade "potential" ore—the iron formation—of the various ranges, in particular the so-called Mesaba "taconite." In addition to research laboratories recently established and now operated by several of the principal mining companies, the cooperative project initiated in 1943 at Battelle Institute in Columbus, Ohio, by some twelve Lake Superior operators, is well under way; also

TABLE 3—LAKE SUPERIOR IRON ORE †
(In Thousands of Gross Tons)

	1939	1940	1941	1942	1943	1944
SHIPMENTS BY LAKE						
From U. S. Lake Ports...	45,002	63,353	79,655	91,004	83,961	80,691‡
From Michipicoten, Can..	71	360	461	473	444	479
Total by Lake.....	45,073	63,713	80,116	92,077	84,404	81,170
SHIPMENTS—ALL RAIL						
From U. S. Mines.....	436	595	1,094	1,396	2,016	1,200*
From Canadian Mines....	39	1	....	14	1	....
Total All-Rail	475	596	1,094	1,410	2,017	1,200*
TOTAL SHIPMENTS	45,548	64,309	81,210	93,487	86,421	82,370*
ORE CONSUMPTION						
By U. S. Furnaces.....	43,480	61,033	74,571	83,714	86,585	84,745*
By Canadian Furnaces...	881	1,393	1,765	2,511	2,442	2,525*
TOTAL CONSUMPTION ..	44,361	62,426	76,336	86,225	89,028	87,270*
STOCKS ON HAND						
U. S. and Canadian At Furnaces and Lake Erie Docks						
On May 1.....	22,791	18,106	16,937	20,065	18,497	17,892
On December 31.....	35,440	36,073	40,457	47,424	43,429	38,100*

* Partly estimated.
† Source: Lake Superior Iron Ore Association.
‡ Includes 16,411 tons Canadian ore loaded at Superior, Wis.

work on this and other iron ore problems continues at the Minnesota Mines Experiment Station; and various commercial concerns are giving detailed attention to problems of iron ore concentration. A three-day symposium at the University of Minnesota at the end of February, 1944, was devoted mainly to this taconite problem, and attracted wide interest. A similar conference is to be held there in early 1945.

The taconite problem involves developing the cheapest effective means of (1) drilling and mining or quarrying the very dense and hard siliceous iron formation, containing 25 percent to 35 percent iron (in the form of finely divided hematite or magnetite —or both); (2) grinding this hard rock, and concentrating the iron minerals; and (3) producing therefrom a product best adapted to use in the furnaces. The actual separation of the magnetic mineral is relatively simple, but of the hematite and of the mixtures, not so simple. In any case, once the technology and economics are satisfactorily worked out, production will require vast capital expenditures for plants and equipment, and much more labor per ton of output—obviously very significant changes in the entire industry. It is fortunate that time is available to work out the problem and that the industry is taking advantage of the time at its disposal. National security requires that our iron ore mines always be prepared for any eventuality. It seems obvious that the Lake Superior operators are planning to be ready when the time may be opportune to construct plants and produce concentrates from the "taconite" or from "iron formation" of other types in the district.

Meanwhile, the situation as to reserves of present commercial grades of ore is not such as to be cause for alarm about the nation's supply in the near future. It is true that some mines have been exhausted and that other large and important ones that have contributed so magnificently to the war demand are nearing exhaustion; and there is no question that the reserves of ore in the hands of some companies on which particular consumer plants have depended largely in the past, are seriously reduced by the demands of recent years. Nevertheless, no over-all shortage is imminent, and there seems reasonable assurance that the Lake Superior district may long continue to supply essentially its normal proportion of the United States and Canadian requirements.

Total shipments from Lake Superior mines from 1850 to the end of 1944 have been approximately 2,200 million gross tons, of which some 6 million tons was from Canadian mines. The full significance of this vast contribution to the economic life of the two countries can hardly be realized, much less appreciated. As has been stated on other occasions, it appears unthinkable that the United States should ever allow itself to become dependent on imports to supply its vast needs for iron ore.

New Equipment and Construction

Space is not available to comment in detail on the year's activities and developments on the ranges. The use of heavy trucks and belt conveyors in place of other haulage at open pit mines has continued to expand, after the pattern of recent years, and considerable new equipment for this purpose has been acquired and placed in service during the year, together with several new excavating shovels. Other open pit mines are to be so equipped for operation in 1945. New construction and expansion of ore concentrating plant facilities has continued, with new installations of crushing, screening, washing and concentration equipment, and conveyors for handling both ore and tailings. Particular attention has been given to recovery of fines in the concentrating plants, and several installations of special machines for this purpose have been made. The most spectacular open pit development (on any of the United States ranges) has been at Embarrass Lake—on the eastern Mesaba — where construction of a long drainage diversion ditch and a dam, pumping of a lake and stripping of an immense volume of overburden, were preliminaries to the successful opening, last summer, of a new mine expected to be a large producer. Other extensive stripping projects were carried on last winter and early spring, some were continued throughout the mining season, and this work is now again very active.

Equipment of new design and improved efficiency continues to enter the iron ore production picture

Important new work at underground mines during the year included several shaft deepening jobs on the Vermilion range in Minnesota and on the Michigan-Wisconsin ranges. At the Zenith mine on the Vermilion range, the deep 66-in. bore-hole was enlarged into a rectangular shaft and equipped with new headframe, buildings, etc.; a similar deep bore-hole at the Cary mine on the western Gogebic was completed and its conversion to a large shaft well advanced, together with construction of head-frame and substantial new mine buildings and installation of hoisting and other surface equipment. At the Pioneer mine on the Vermilion range, a new inclined offset replacing the shifting upper section of the vertical "A" shaft was completed and placed in service.

The emergency ore dock built by the government at Escanaba, and never completed beyond the timber structure, is being dismantled to use the timber elsewhere for now more necessary projects.

The U. S. Geological Survey in cooperation with the Michigan Survey has continued geological studies in

the Iron River-Crystal Falls area of Michigan and is working out some structural guides that are expected to be very useful in further exploration in that area. Also valuable studies on ground water control were carried on there during the year.

The State of Michigan, initiating a new program, has leased to one of the large operating companies about 12,000 acres of state-owned lands in Dickinson County, on a 50-year basis on terms designed to encourage exploration for new iron ore deposits.

Canadian Lake Superior Operations

Total 1944 Canadian mine shipments were 495,608 gross tons, of which all except 16,411 tons was from the Helen mine near Michipicoten. In the Michipicoten district, where the Helen mine of the Algoma Ore Properties, Ltd., has been the sole producer, a new operation is expected to be added early in the 1945 season—the Josphine-Ruth property of Michipicoten Iron Mines, Ltd. (owned jointly by Sherritt-Gordon and Frobisher Exploration Co., Ltd.). The Josephine ore-body is hematite, and the Ruth, siderite—similar to the Helen. The Josephine is expected to be the initial producer, although arrangements are reported being made to produce carbonate also, to be sintered at the Algoma plant.

The new Steep Rock mine on the Atikokan range of western Ontario got into production late in the season and shipped to United States furnaces 16,411 tons from open-pit operations. Although delayed in the past season by weather and conditions in the lake-bed pit, mining is expected to proceed on a substantial scale next spring, with shipments via Port Arthur—140 miles distant—and the new ore dock which is expected to be completed by that time.

Outside the Lake Superior area, but of interest to its operators nevertheless, is the further exploration of the extensive iron-bearing area of northern Labrador and adjacent Quebec, in which undertaking the M. A. Hanna Co. and a Hollinger subsidiary are associated. During the past season further geological surveys and also a diamond drilling campaign were carried on—with all transportation handled by airplanes. Typical Lake Superior iron formation and significant exposures of ore over wide areas have been previously reported in this region, about 250 miles from the Gulf of St. Lawrence.

Other Districts

Eastern.—As has been noted before, the eastern magnetite industry of New York, New Jersey and Pennsylvania is closely related to the Lake Superior industry because operators from the latter are largely engaged in its mining work and much of the output is for furnaces otherwise dependent on lake ore.

On the basis of ten months' figures of the Bureau of Mines, and other data, shipments from these mines are estimated at 3.6 million gross tons of high-iron product (62 percent to 68 percent Fe) in 1944, or about 10 percent increase over the previous year. (See Table 1.)

Republic Steel Corp. is the largest operator in the Adirondack district. Its operations near Mineville and Port Henry include the Old Bed and Harmony mines now jointly designated the "Don B"; there is also a concentrator and sintering plant, and the Fisher Hill mine—a new D. P. C. project including a new concentrator and sintering plant put into operation the past year. The latter mine is only partly developed, however, because of the manpower shortage, which also seriously handicaps all these operations. The new concentrator and sintering plant are operating on both Fisher Hill and Mineville ores. Output of these operations and the Chateguay mine at Lyon Mountain, in 1944, are expected to total about 1.25 million gross tons of shipping product (high grade sinter, lump and some concentrate)—about half their rated capacity when fully developed and manned. Eleven hundred more men are reported to be needed at these operations. In 1945, output at Republic's New York operations is expected to be about 1.5 million tons of shipping product from Mineville and Chateguay and 0.5 million tons or more from Fisher Hill, depending on available manpower. Extensive application of the diamond drill in making blast holes is an interesting recent development at the "Don B" operation.

McIntyre Titanium and Magnetite

The McIntyre project of National Lead Co., 40 miles west of Mineville, has continued throughout the year its operations which began in 1942—producing magnetite along with ilmenite produced for its titanium content. A new sintering plant for treatment of the magnetite was put in operation during the year, but production as yet is limited. Output of magnetic concentrate—at about three-fourths capacity—will somewhat exceed production last year which was nearly 400,000 gross tons, but a large proportion is still being stockpiled. Further steps in the concentration are reported as being worked out to improve recoveries.

Benson Low Phos. Sinter

Benson Mines of Jones & Laughlin, in Lawrence County, N. Y., has been in production throughout the year, and output of high-grade low phos. sinter and concentrate is expected to be about 380,000 gross tons for the year. This project—an open cut mine, with a concentrator and sintering plant—is designed for a capacity of about a million tons annually of shipping product, but has been handicapped by lack of men. Capacity production in 1945 is expected if manpower is available. A new pilot mill, to study the problem of recovering the non-magnetic oxide — martite — that occurs in places with the magnetite, is reported about ready for use.

Clifton Output

At the Clifton mine of the M. A. Hanna Co., production has continued throughout the year, mostly from the open-cut operation, while preparations have been under way for underground mining. Operations are now approaching capacity, reported at about 250,000 gross tons annually of 62 percent Fe., low phos. sinter and a small amount of lump. Output in 1944 is estimated at 215,000 tons of sinter and 8,000 tons of lump. The mine is expected to be wholly an underground operation by March, 1945.

Considerable iron ore exploration has been going on in various areas of the Adirondack region, including work by the U. S. Bureau of Mines which has had four drills operating in 1944 in the general vicinity of Benson Mines. However, exploration, the same as mining, has been handicapped in this area by shortage of labor.

Northern New Jersey

In the northern New Jersey magnetite area, Alan Wood Steel Co. is the largest operator—its properties including the Scrub Oak mine, Washington and McKinley mines, and the Ringwood mine, the latter not yet ready for production. At Scrub Oak, operations have been maintained in 1944 about as before—at somewhat less than capacity. The Washington mine shut down in October, but production from the McKinley ore-body—which was started in 1943—continues, and the ore is concentrated at the Washington mill. Capacity of Scrub Oak and Washington combined

Direct loading into railroad cars contributes importantly to iron ore production

is about 460,000 gross tons, and output in 1944 is expected to be about 400,000 tons. Ringwood—a new project including the Cannon and Peters mines—is not yet completed. The project includes a new mill to treat about 2,400 tons of ore per day—with rated output of concentrate in excess of 300,000 tons per year.

At the Mt. Hope mine, equipment of the new 2,600-ft. No. 2 shaft is essentially completed and ready for hoisting ore. Meanwhile, the new mill has been operating for some time on the rejects from the lump ore mill at the old shaft. This property normally produces about 70 percent of its output as lump and the balance as concentrate. The new shaft and mill are expected to increase the total capacity from about 135,000 gross tons to about 670,000 gross tons annually, making it by far the largest operation in New Jersey. Here, as elsewhere, manpower has been the problem.

At the Richard mine of Brooke Iron Company, operations have continued about as usual, producing nearly equal tonnages of high-grade lump and concentrate and operating at about two-thirds its rated capacity of 240,000 tons of crude ore annually.

A year ago several other mining possibilities in New Jersey and one in the old Croton district of southeastern New York were being contemplated, but none have materialized thus far.

Geologic and magnetic surveys and considerable exploratory drilling have been going on in the iron ore belt of New Jersey. The U. S. and the New Jersey Geological Surveys and the U. S. Bureau of Mines have been engaged in this work, as have also various mining interests.

Pennsylvania

The Cornwall mine at Lebanon, Pennsylvania, long operated by Bethlehem Steel Co., continues at capacity, the crude ore being treated at the concentrator at Bethlehem. Rail haulage in the pit was abandoned and replaced by truck operations during the year.

The new Scotia mine project near State College, Pa., is nearing completion, and the property is expected to get into production early in 1945. This is to produce open-pit brown ore which is to be washed and then treated in a "sink and float" plant to separate the silica. Capacity is reported at about 400,000 tons annually. Butler Brothers—Lake Superior operators—are handling this enterprise.

Southern.—Output in this district—including Alabama, Georgia, Virginia, Texas and Missouri—in 1944 is estimated at 7.8 million gross tons, compared to 8.53 million in 1943 and 9.21 million in 1942. Most of the ore was for use in Alabama furnaces, but the Missouri output went to Granite City, Ill., and the Texas product was shipped largely to the new furnace at Houston, some to Granite City, and some to Alabama for experimental use in the open hearths. Eighty percent of the ore used in Alabama furnaces is the local "red ore," the balance being "brown" limonite ore, supplemented by some pyrite cinder and sinter from Virginia and Tennessee.

Alabama

Ore production continued in 1944 from all the red ore mines in the Birmingham district which were operating at the end of 1943. Republic had to shut down its Spaulding mine in September for four or five months because of failure of the large primary crusher. The Raimund also having been shut down, in 1943, Republic furnaces have been recently operating mainly on stockpiled ore. Sloss-Sheffield has completed the first unit of its beneficiating plant at the Ruffner mine, with capacity of about 500 tons of product per day. Brown ore production from both Alabama and Georgia has been well maintained by the principal operators, although Sloss-Sheffield is reported as the only steel company now operating brown ore mines for its own account. These are in the Russellville district.

Woodward Iron Co. is obtaining most of its requirements from its Pyne mine, through the 1,200-ft. shaft sunk in 1918 but not put into use until 1943. This is the first mine to be opened by a vertical shaft below the outcrop, and it is expected to be a large producer.

As the calcerous better red ores become exhausted, concentration—including fine grinding and sintering—must be resorted to in order to produce satisfactory furnace feed from the abundant lower grade, more siliceous material. Much work has been done on this problem over many years, the pilot plant built by Republic at the Spaulding mine in 1940 and expanded as a D.P.C. project in 1943 to 1,800 tons daily capacity of concentrate, being the latest undertaking. (See Engineering and Mining Journal, October, 1944: "Birmingham's Future Depends on Concentration," by Oscar Lee of Republic Steel Corporation). Obviously, Alabama has a problem analogous to that of the Lake Superior district in assuring its future operations.

Texas

In northeastern Texas, Sheffield Steel Corporation got into production of brown-ore concentrates in both the North and South "basins," for use at its Houston blast furnace. Some ore also was imported from Durango, Mexico, for this furnace. Lone Star Steel Co. has operated its beneficiation plant on limonite and carbonate ore, but its blast furnace at Daingerfield is not completed, and the ore was shipped to Houston, to Granite City, Ill., and to Gadsden, Ala.

Missouri

In southeastern Missouri, some production continued during the year from the small brown ore mines and the "sink-hole" hematite deposits. But of principal interest is the reopening of the Iron Mountain mine by the M. A. Hanna Co., where the new mill was started late in November. Shipments to the Koppers furnace plant at Granite City, Ill., were expected to total about 12,000 tons by the end of December, 1944, and the operation is expected to produce at capacity of about 250,000 tons of concentrate per year in 1945. Concentration is by jigs and tables, making an excellent product about 55 percent in iron and low in phos. Mining at present is by open cut but later will be underground.

Western.—Total output from Western mines mainly in Utah, Wyoming and California, is estimated at about 2.8 million tons of which 1.5 million is from Utah and the balance about equally divided between the other two states. This is considerable increase over 1942 and 1943. Utah ore—from the Iron Mountain district near Cedar City—was supplied mainly to the two Columbia Steel Co. blast furnaces at Provo and also to the two operated at the new Geneva Steel Co. plant, north of Provo. Some Utah ore also was shipped to the Colorado Fuel and Iron Company furnaces at Pueblo, Colo., to supplement ore from its Sunrise mine in eastern Wyoming, where the new shaft and development work have been delayed in completion.

The Kaiser furnace at Fontana, Calif., blown in in January, 1943, has been supplied heretofore from the Vulcan mine at Kelso, Calif. However, it is understood that a contract recently has been made for Utah ore to supply this plant, but to what extent is not known.

The U. S. Geological Survey and Bureau of Mines, and also the mine operating companies, have been engaged for the past two years in field studies and drilling in the Utah iron ore district, and reports indicate development of substantial additions to reserves there. Also, these federal agencies cooperating with mining interests working in Wyoming are reported to have developed considerable additional reserves there.

Conclusion

The over-all 1944 iron ore record appears highly satisfactory, despite some severe labor shortages and difficulties and delays on most of the special projects at mines, concentrators and sintering plants.

Of the new blast furnaces in the expansion program, four D.P.C. plants have not been put into operation. These are: one at the Inland plant at Indiana Harbor, Ind.; the new Pittsburgh Steel Co. furnace at Monesson, Pa.; the Lone Star Steel Co. furnace at Daingerfield, Tex.; and one of the three Geneva Steel Co. furnaces north of Provo, Utah. Except for some unforeseen developments, these plants do not appear to be needed for war production, at least thus far.

Government announcements of war supply projects involving large new plants for making munitions and other war products, rapid expansion of such production in many existing plants; apparently undiminished requirements for allocation of steel in the next few months, and other significant indications—all point to little, if any, change in furnace requirements of iron ore for some months ahead. Even after V-E day, the achievement of final victory over Japan may require far more of the goods of war than heretofore has been contemplated.

The iron ore industry and the associated rail and lake transportation agencies have well demonstrated over the past war years what they can do, and may review with justifiable satisfaction a task well done. At present, however, they need but look forward to continuing at the same kind of strenuous job—for how long, no one can say. Meanwhile, there is reason for assurance that—given the minimum necessary manpower—whatever tonnage of iron ore is required for war in 1945 and thereafter will be forthcoming as needed. Beyond the war period, it seems most vital that the national policy be consciously and vigorously directed toward preservation, in our economy, of the traditional American "incentive system" as the best means of assuring adequate future supplies of iron ore as well as other essential commodities on which our national well-being and security depend.

The American Soo locks at Sault Ste. Marie, Mich., represent a highly strategic point in the Great Lakes transportation system

FERRO-ALLOY Metals

A Continuation of the Present Status of the Ferro-Alloy Minerals and Metals is Indicated at Least Until a Major Change in War Requirements Takes Place

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THE ferro-alloys, their ores and related metals, unlike some of the more generally known basic war materials, are widely subject to the vagaries of nature, the war developments and numerous other indeterminate factors often beyond the control of the industry division. For this reason it may be difficult for those not intimately connected with the war program in these metals, to understand many apparent inconsistencies and wide swings in the supply demand position of these metals.

Emergency Measures and Controls

Early in the war, and even before Pearl Harbor, many of the ferro-alloy materials were in a critically tight position. This situation was substantially corrected by extraordinary and emergency measures, the turning point having in some cases been reached as early as the latter part of 1942 and early in 1943. Controls on several of the metals were removed largely in late '43, even though the tempo of the war and the magnitude of the war production program did not diminish. The correction of early production deficiencies, however, did not, unfortunately, constitute a permanent solution to the supply problems of many of the ferro-alloy materials.

As the war progressed, early threats to primary foreign sources and to ocean shipping transportation were succeeded by the progressively acute manpower shortage in this country. Then followed intermittent and increasingly greater demand for ocean shipping and foreign land transportation, as a result of the shifting emphasis of war and of the theaters of operation as well as internal requirements in those countries affected.

The result has been, as industry well knows, a wide swinging of the pendulum between tight and comfortable or easy situations in many of the ferro-alloy materials.

As the political and territorial scope of the war and its operations broadened, so have those various problems affecting procurement broadened and intensified.

Ferro-alloy Requirements

As the ferro-alloys are so closely related to alloy steel insofar as the major use is concerned, it has been natural for industry to associate the supply demand position of the ferro-alloy materials with the overall tonnage of alloy steels. This resulted in considerable confusion, of cross currents in appraising or understanding the realities of the situation with respect to the individual alloys.

Although total alloy steel production declined from a level of close to 1,300,000 tons per month at the peak to something less than 1,000,000 tons per month, there has not been a horizontal reduction in the requirements of the ferro-alloys.

Shifting of military programs has been responsible for wide divergencies in the consumption of specific ferro-alloys because of differences in the type of steel and metallurgical pattern. Shifting in emphasis from one branch of service to another, although not appreciably altering the overall alloy steel tonnage, has similarly shifted the burden from one or more alloying elements to others.

Important changes in material requirements have also come about as a result of changes from one type of airplane to another, particularly with the later trend toward high altitude equipment.

These factors must be fully appreciated and weighed to understand the wide discrepancies in projected metal and alloy requirements, both with respect to the continuation of the war program along adjusted patterns and with due consideration for military cutbacks anticipated in connection with the decline of military activity or cessation of hostilities in the European theatre. In the latter case, many of the ferro-alloys will be in abundance insofar as war requirements are concerned and probably with respect to any reasonable civilian requirements, while others will con-

Manganese production at the Three Kids mine in Nevada was stopped during the year due to adequate tonnages available from other sources

tinue in a tight balance with no appreciable quantities being available for nonessential civilian production.

While every effort has been made to relax or remove the controls from the ferro-alloy materials as rapidly as that can be done safely and consistent with the requirements of the war effort, and it is desirable to allow industry as full leeway as possible in reconversion plans and a return to full civilian production, until the war is completely over, the protection to military requirements must be the foremost consideration.

Some of the pertinent facts and highlights of the individual ores or metals are discussed below under the individual subject headings.

Manganese

Throughout 1944 the program of curtailing production of domestic manganese ores of low grade was continued as it became evident that these materials were no longer needed in the war program. Practically all procurement of sub-standard ores inaugurated early in the war for insurance purposes was either terminated or plans for its discontinuation were put into effect.

Similarly the production of nodules at Las Vegas was stopped and arrangements were further made to end the purchase of Montana carbonate ores for nodulizing.

Stocks of high grade metallurgical manganese in this country have declined from the comfortable position at the beginning of 1944 due largely to transportation problems. Not only has the burden on rail facilities from mine to port in the principal producing countries been a problem, but opening up of the European theatre of war and subsequently the greatly increased tempo of the Pacific operations have placed greatly increased demands on available bottoms, although no serious situation exists or is even in prospect.

There is not expected to be any surplus ocean shipping capacity for some time. Nevertheless, the manganese situation may return to its early 1944 supply position some time in 1945 with the availability of large Russian supplies, since primary sources there have been safely released from former German control and water routes from Black Sea ports have been made reasonably safe.

It is expected that near capacity operations in the steel industry will continue until the termination of hostilities in Europe. On this basis, requirements of manganese for that period may be expected to continue at a high level.

Chrome

Closely following the pattern of manganese, a steady decline in the production of low grade domestic chrome ores and concentrates has taken place. Stocks of low grade material are ample and the need for this insurance type of production and stocks has largely disappeared. The main emphasis remains on standard grade lumpy metallurgical and on chemical ore.

Stocks of high grade material have been somewhat reduced during the past year both because of internal transportation requirements in foreign countries and the increased burden put on ocean shipping. Total stocks of chromite and of high grade lumpy metallurgical ore in the United States are adequate for substantial insurance against any interference to supplies. Consequently no critical situation is likely to develop although the large military requirements for available shipping will for a time at least, further restrict the use of cargo space for chrome ore, so that chrome will continue for some time in 1945 under close scrutiny and increased control. No important change in consumption is indicated now because of these factors.

Scheelite from the alluvial gravels of Baltic Gulch in California is mined by power shovel and hauled to plant by truck

Tungsten

Practically all Government activities in tungsten were effectively discontinued during 1944. Early in the year the domestic purchase program at premium prices was ended. Also foreign procurement was ended with the expiration of outstanding contracts. Imports from China no longer make an important contribution to this country's total supplies.

Mine depletion in the United States alone has accounted for a substantial drop in production here and price considerations will be an important factor in governing foreign output, probably at lower levels than 1944.

Supplies of tungsten have continued to increase through 1944 so that stocks on hand are more than adequate to take care of any foreseeable requirement.

Consumption of tungsten has, unlike many of the small tonnage ferro-alloy materials, been maintained at close to peak levels. The return to the early war level of requirements is largely due to shifting in emphasis in military equipment and ordnance as well as shifting in tool steel types. This situation is not expected to change appreciably except as it may parallel changes in the war production program and consequent over-all alloy and tool steel requirements.

Molybdenum

The supply of molybdenum during 1944 has declined sharply due to lessening of demand placed on this alloying material and later the effect on mine and smelter of the growing tightness and shifting tendency in manpower, particularly noticeable in the latter part of the year.

Changes in emphasis on military equipment and other direct metallurgical changes have also influenced the consumption of molybdenum. All direct Government interest in the procurement of molybdenum from abroad has ceased, although foreign demand may sustain the moderate outside production.

Stocks of molybdenum, however, remain adequate and it is not expected that any material change will develop under present metallurgical control pattern in either the supply or demand position, at least before the end of the European phase of the war.

Vanadium

A complete withdrawal of the Government from the vanadium production program has been effected, both as to procurement of ore and direct production of vanadium. It is not anticipated that Government activities in the ore program or in the operation of Government treatment plants will again be necessary from the standpoint of the war program.

A partial reduction of ore piles has taken place and more complete disposal of the stocks of domestic ore may be effected this year.

Present stocks of vanadium together with current new supply derived from domestic and foreign industry sources are sufficient to maintain this metal in a comfortable position as far as can be projected at this time, although the return of this alloying material to some former uses which were taken out as a war measure may carry the consumption upward.

Nickel

This metal has maintained the most consistent record of any of the ferro-alloy materials. Widespread efforts to increase the available supply have met with some success. Heavy demands, however, have made it necessary to maintain rigid control in its allocation, both for metallurgical and alloying applications as well as for important nonferrous uses.

Practical production levels have been approached or reached in new production projects for nickel during 1944. As a result some improvement is expected in the available supply of nickel during 1945, particularly as Cuban production approaches capacity and that material becomes available for industry use.

While some easing in the tight position of nickel is anticipated, it is not expected that the supply will be sufficient for any widespread relaxation of restrictions on use, or the removal of metallurgical controls. Tightness in special high nickel alloys and mill products during 1944 has developed in a degree not experienced during the earlier war period. Special military projects and unusual shifts in aircraft types have, in part, been responsible for this development which has no direct relation to the over-all position of nickel itself. No important change in this tight position is in sight. While there is little question regarding the supplying of all military requirements, volume of material for civilian use may be postponed until the reduction in war programs contemplated after victory in Europe.

Cobalt

Late war developments in equipment and ordnance experience, as well as other military applications have tended to reverse the earlier excess supply position of cobalt, and it is expected that consumption during 1945 may exceed the previous war years.

Stocks of cobalt and the production of this metal have kept pace, however, with the changing pattern, and there is yet no indication that there will not be adequate supplies for all essential purposes. Current indications furthermore point to a continued available supply for other than war uses paralleling the 1944 experience.

TABLE I

	Consumption	
	Prewar	Current 1944
Manganese ..	674,583	1,400,000*
Chrome	362,873	800,000*
Tungsten	5,047,800	19,000,000†
Molybdenum .	23,149,800	44,000,000†
Vanadium ...	1,519,600	3,400,000†

*Tons.
†Pounds.

TABLE II

	Stocks December 31, 1944
Manganese	1,400,000*
Chrome	1,100,000*
Tungsten	34,000,000†
Molybdenum	28,000,000†
Vanadium (not including ore)	2,200,000†

*Tons.
†Pounds.

TABLE III

	Ore Production	
	Prewar	Current 1944
Manganese ..	30,683	200,000*
Chrome	1,506	40,000*
Tungsten	2,803,600	11,000,000†
Molybdenum .	23,130,200	39,000,000†
Vanadium ...	633,600	1,900,000†

*Tons.
†Pounds.

Rutile, Zircon, Baddeleyite, and Columbite

These minor ferro-alloy ores are not expected to show any appreciable change during 1945 over the pattern of 1944 either with respect to production or new supply, or to consumption. Some preliminary indications suggest the possibility of a further tightening in the columbium position. Metallurgical substitutions may be available, however, to alleviate any projected demand in this material beyond the present available supply.

Stockpiles

During 1944 the all important question of stockpiles and the disposition of the relatively large accumulation of strategic minerals and metals at the end of the war, has been substantially clarified by legislation, at least for a time.

There will be no immediate threat to production or to the markets of strategic minerals and metals included in the ferro-alloys group because of Government stockpiles or stocks of these materials accumulated for purposes of war consumption or protection to the war program.

It would be hazardous to forecast within very close limits the outlook for any of these materials closely related to the war program, or policies which may govern the action of the war agencies. This is particularly true because of the wide scope of the war and the enormous problems not solely of procurement and disposition which have a bearing on this subject. Experience in the latter half of 1944 clearly demonstrated the risks both to normal business and industrial planning, and to the military programs, of premature thinking and hasty projection of schedules in the current war program.

We cannot safely forecast the duration of the war or of the magnitude of the war production program, nor can we count on a static position in the all important manpower problem, either with respect to availability or productivity, particularly as long as the war program continues in anything like its present volume and subject to wide variations in demands.

It can only be said that every indication points to a continuation on approximately the present status of the ferro-alloy minerals and metals until the European phase of the war is over, or at least until an important change in the war production program takes place in anticipation of that eventuality, or for military or supply reasons.

ANTHRACITE—

Increased Production Attained Despite Manpower Losses; Further Advances Made in Conservation, Research and Preparation

By FRANK C. WRIGHT, Jr.
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The Anthracite Industry

THE anthracite industry reached a 13 year peak production in 1944—the highest since 1930. Commercial tonnage for the year is estimated at 60,708,000 tons. Including colliery fuel and dredge coal, total production approximated 64,445,000 tons.

This great achievement was accomplished with 12,000 fewer men on the payrolls than in 1941 when commercial production was only 52.6 million tons. The 1944 performance is truly remarkable in comparison, for the total production of 64 million tons was produced with only 76,000 men on the payrolls. Working time reached an all time high with an estimated 300 days. Stripping, underground mechanization and culm bank production each contributed its share of the increase.

Supply and Requirements

Due to the general fuel shortage in the East, the increased supply of anthracite for replacement of other space heating fuels could not keep pace with the increased demand. Oil has gone to war, coke was withdrawn from the domestic market for metallurgical use, and wood was shortest of all due to the lack of manpower to produce it.

Consumers of domestic sizes, buckwheat and rice, were limited to 87.5 percent of their normal annual requirements, so that the growing number of people who needed fuel could have a share of anthracite's increasing supply.

The industrial sizes of anthracite, Barley and No. 4 Buckwheat, have been ample all during the year; in fact surpluses have been a problem to the producing companies. Rice restrictions were eased toward the end of the year as the supply overtook requirements.

1944 Production

Preliminary figures from the U. S. Bureau of Mines and the Anthracite Committee are used in the following tabulation. Final revisions are usually upwards, but these will not be available for some time. Projecting percentages of production by sources for ten months over the year, we arrive at the following comparison of 1944 and 1943.*

Source	1943	%	1944	%	Change
Deep mines	42,736,000	72.0	42,653,000	67.7	— 83,000
Strip pits	8,989,000	15.2	10,356,000	16.4	+1,317,000
Culm banks	7,584,000	12.8	10,036,000	15.9	+2,452,000
Total	59,309,000	100.0	63,045,000	100.0	+3,736,000

* These figures do not include Dredge Coal which reached an estimated 1,400,000 tons in 1944, compared with 1,335,000 in 1943, an increase of 65,000 tons.

Colliery fuel usually constitutes about 4.5 percent of total production, which would indicate a production of 2,837,000 tons in 1944, as against 2,374,000 tons in 1943.

Production from deep mines has been hit hardest by the loss of manpower; and mechanical mining has made a great contribution toward sustaining underground tonnage of the all-important domestic sizes.

The following table shows the trend of mechanical loading in 1930, 1941 and 1944 (estimated):

	Deep Mined Production	
	Hand Loaded	Mechanically Loaded
1930	60,459,000	4,468,000
1941	30,435,000	13,442,000
1944 (estimated)	27,938,000	14,715,000

Figures showing production from the various fields are not yet available for 1944, but the accompanying chart from the U. S. Bureau of Mines illustrates the trend from 1850 through 1943.

Conservation

New customers added to the requirements of anthracite for space heating at a faster rate than production could be increased. Continuing shortages of coke, fuel oil and wood caused more and still more home owners to turn to anthracite for heat.

The Solid Fuels Administration restricted customers to 87.5 percent of normal supply on domestic sizes, buckwheat and rice. Conservation was urged by Solid Fuels Administrator for War, by the producing companies and in a concerted campaign in newspapers by Anthracite Industries, Inc. Only by limiting deliveries to the 5,000,000 regular anthracite consumers, could the new customers be kept warm.

A three-way public relations job was carried to the consumers via the newspapers: (1) The need for conservation was explained; (2) exactly how to save coal was shown; and (3) consumer good-will was maintained through exposition of the over-all industry problem.

The War Production Board implemented the conservation program by granting priority to a large schedule of thermostats and heating controls. The trade and the public were told of this through newspapers and the trade papers. The conservation booklet, *"How to Conserve Anthracite and Improve Your Heating,"* was so well received that over 3,000,000 copies were distributed by Anthracite Industries, Inc., since the start of the campaign. One hundred and twelve newspapers in 66 cities were used in the campaign.

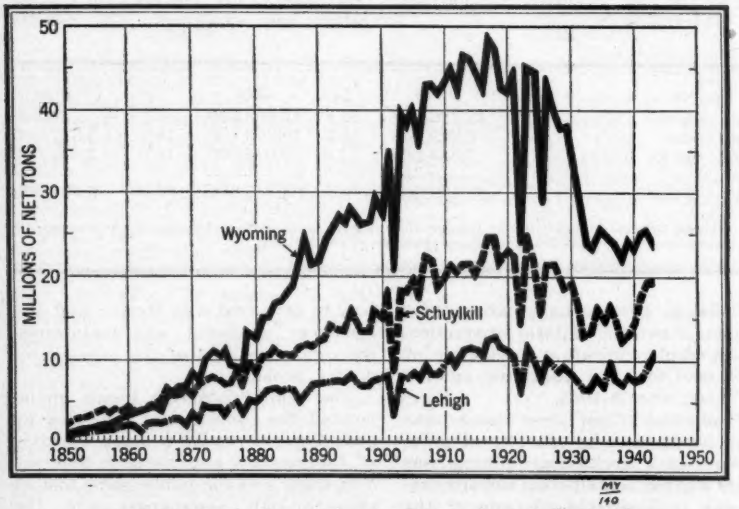
Manpower Trends

Deferment policies of the War Manpower Commission permitted retention of some experienced key men of draft age during 1944. Certificates on each

key man were filled out by applicant companies, and processed by the SFAW field offices, with the aid of the industry manpower committee. These were forwarded to the USES State Director, and a large number of vital men were thus retained.

However, there are almost 12,000 fewer men working in the anthracite industry today than in December, 1941. The most acute manpower shortage exists in the Wyoming field which has lost 12,185 men—more than the industry total. The Schuylkill field has gained slightly in recent months as former bootleg miners have returned to legitimate mining.

Between December, 1941, and December, 1942, the Wyoming field lost 6,842 men; the Lehigh field lost 1,238, and the Schuylkill lost 34. From January, 1943, to December of the same year, the Wyoming field lost 4,202 more men, while the Lehigh field gained 91 and the Schuylkill added 782 to its forces. From January, 1944, to October, the Wyoming field lost another 1,940 men, while the Lehigh field dropped 225 and the Schuylkill picked up 432.



Production in the three anthracite districts shows similar trends

The decrease in the number of men stealing "bootleg" coal indicates the source of new legitimate miners in the Schuylkill field.

The vigorous efforts of the Solid Fuels Administrator for War to save the remaining miners are very much appreciated. It is hoped that all concerned will continue the strongest possible efforts to prevent further drainage of miners and to regain lost men during this year.

According to statistics compiled for the Solid Fuels Administration for War by the Anthracite Institute, the average age of miners is now 45.0 years. This is an increase of 12 years in the average since 1939 when the average miner was 33 years old (figures from SFAW).

Labor—A Review of Events

Negotiations started in 1943 were not terminated until the new contract between the U. M. W. and anthracite producing companies was approved by the War Labor Board on April 7, 1944. The main events during this long negotiation are shown in the following chronological table:

1943

February 12—Secretary of the Interior requested anthracite operators and the U. M. W. A. to begin negotiations not later than March 22.

March 31—U. M. W. and anthracite operators opened negotiations in New York City.

April 27—U. M. W. Secretary-Treasurer Thomas Kennedy, announced that in the absence of contract, all anthracite coal miners were to suspend work at midnight April 30.

April 29—President Roosevelt directed John L. Lewis and Thomas Kennedy to return striking anthracite miners to their jobs by 10 a. m., May 1, because coal strikes were interfering with the war program.

April 30—John L. Lewis telegraphed President Roosevelt indicating refusal of President's ultimatum. Secretary of Labor certified anthracite dispute to War Labor Board.

May 1—General strike in progress. President Roosevelt issued executive order directing Secretary of the Interior to take possession of coal mines. Secretary Ickes took immediate possession without violence of use of troops. United States flags were run up over the coal pits; chief mine executives were designated as Government operating managers, and mines made ready for immediate re-opening. War Labor Board panel held deliberations pending resumption of work.

May 2—President Roosevelt called on mine workers to return to work. Lewis announced 15 day "truce."

May 3 and 4—Miners began returning to work.

May 17—Secretary Ickes requested mine workers to continue working after expiration of May 18 truce dead line and expressed hope that way would be opened for collective bargaining conferences. Lewis telegraphed Secretary Ickes that "truce" would be extended to May 31.

June 21—General walk-outs began in mines.

June 22—U. M. W. instructed miners to return to work under direction of Secretary Ickes as Federal custodian, and to continue to work until October 31.

June 25—War Labor Disputes Act (Smith-Connally Act) became law.

June 27—Miners began returning to work.

October 28—War Labor Board issued decision in anthracite dispute granting "Little Steel" allowance, increased vacation and tools.

November 1—General strike under way. President Roosevelt issued executive order to Secretary Ickes to take over coal mines again. Secretary Ickes took immediate possession of mines.

November 3—Secretary Ickes and U. M. W. representatives drafted memorandum of agreement calling for 15 minutes additional work during lunch hour at time-and-one-half pay. Agreement submitted to War Labor Board.

November 5—War Labor Board approved memorandum of agreement, subject to clarification and re-submission on certain points.

November 7—Most miners back at work under Ickes-Lewis agreement.

1944

January 14—Attorney General Biddle advised Secretary Ickes that War Labor Disputes Act does not require Government to relinquish possession of mines in absence of an industry wage contract where there is the threat of a walk-out.

May 8—Anthracite operators and U. M. W. agreed on new wage con-

tract when mines are returned to private operation.

April 7—War Labor Board approved anthracite contract between operators and U. M. W. A.

1944 has had relatively few strikes during the year and these were entirely of a local nature. Upon request of the Solid Fuels Administrator for War, anthracite miners worked on Sunday during the month of February with the exception of a few locals who voted against Sunday work in District 9.

Strike losses for the year 1944 are estimated at 1,027,000 tons as against 5,700,000 tons in 1943.

Bootleg Coal

Since the stealing of coal originated in unemployment during the depression, it is to be expected that full employment would reduce the production of stolen coal. It has been confined largely to District 9.

A survey in March, 1941, showed 3,006 active holes, with 10,762 men working in them. The most recent estimate shows that there are about 390 active bootleg holes, and less than 2,000 men at work currently. The men who have departed have gone into war plant jobs, the armed forces and into legitimate mines; and there is a real opportunity to eliminate bootlegging entirely if the authorities would enforce laws now on the statute books.

Estimated production of stolen coal in 1943 was 1,924,000 tons, while the preliminary estimate for 1944 indicates about 1,332,000 tons. This is a drop of almost one-third from last year, and shows real progress from the peak of 6,300,000 in 1941.*

It is hoped that the Commonwealth of Pennsylvania will act decisively during the coming year in stopping the theft of coal from its taxpayers. The time for inertia and timidity is past.

Mine Safety

Another record was broken in 1944—in tons mined per accident. The figures for the year up to October 1 show that 383,406 tons of anthracite were mined for each fatal accident. This contrasts sharply with 1938 when 207,038 tons per fatal accident were produced. This represents an 85 percent improvement in six years. Both the producing companies and the miners were publicly commended by Deputy Solid Fuels Administrator C. J. Potter for this fine performance.

The trend since 1933 is shown on the following table:

TABLE 1—PRODUCTION PER FATAL ACCIDENT

Year	Tons
1933	213,395
1934	218,458
1935	192,356
1936	225,162
1937	243,869
1938	207,487
1939	244,761
1940	283,112
1941	285,408
1942	257,509
1943	278,856
1944 to October 1	383,406

Figures from Commonwealth of Pennsylvania Department of Mines.

TABLE 2—CAUSES OF FATAL ACCIDENTS

Direct falls	40
Indirect falls	22
Falling material	1
Fall of person	4
Cars	18
Electricity	3
Explosion of gas	2
Blasts	14
Miscellaneous	16
Outside	18
Total	138

The companies have been increasingly safety-conscious and have made constant improvement in the methods and regulations governing the safety of the miners. The older, more experienced miners are also more practised and cautious than the younger men who are employed in peacetime.

Non-fatal roof fall accidents are averaging one for every 100,415 tons, as against one for 55,723 tons in 1938—an improvement of 80 percent in six years.

The causes of fatal accidents are shown in Table 2, which indicates that direct and indirect roof falls are continuing as the greatest danger in the mines. This table shows fatal accidents by causes for the year 1944 to October 31.

The anthracite producing companies are making a great effort to further improve their mine safety practices, and the suggestion has been made that a training school for miners would go far toward the development of good habits of safe procedure in the mines.

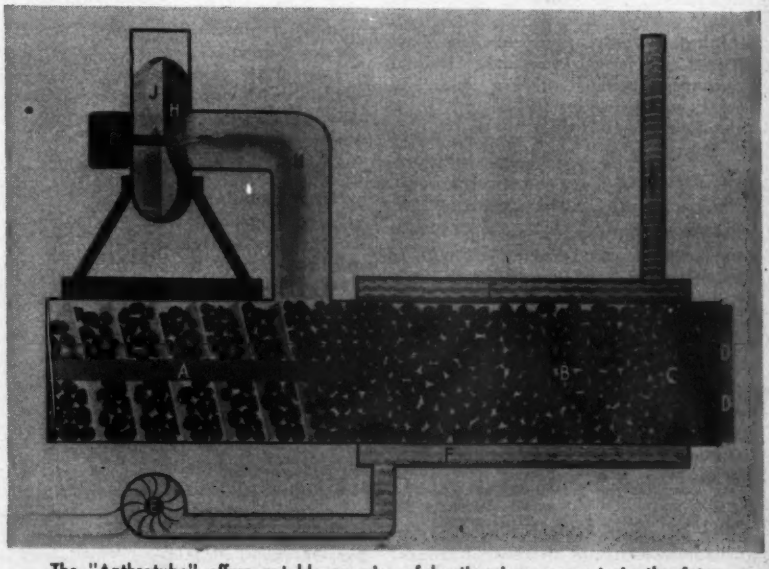
The operating companies, the U. S. Bureau of Mines, and the Pennsylvania Department of Mines, have cooperated in a concerted drive to reduce accidents, and the above results show a very worthwhile improvement over recent years. Further improvements are anticipated.

Review of Research in 1944

Combustion

After several years of intensive research on combustion, the laboratory of Anthracite Industries, Inc., announced a completely new principle for burning anthracite. On August 7, the "Anthratube" was shown to the trade and the press, and was immediately recognized as a revolutionary new method for furnishing efficient, convenient, automatic heat at low cost. This method differs from stokers of the conventional type in that it will burn the domestic sizes such as chestnut and pea, while heretofore buckwheat and rice were the "automatic" sizes.

The extreme simplicity of the new principle is shown in the following diagram and description:



The "Anthratube" offers notable promise of heating improvements in the future
—*Mining Congress Journal, September, 1944*

* Figures from the Anthracite Committee.

The mechanism for applying the new principle is simply a tube surrounded with a water jacket as shown. A revolving worm (A) introduces the coal automatically into one end of the tube. The coal burns in the center of the tube (B) and the ash is discharged at the other end (C). Draft is provided by air which enters at the ash end of the tube (D) and is drawn through the incoming coal by an induced draft fan (J) in the smoke pipe (H). No secondary air or secondary combustion space is necessary, because under proper conditions anthracite burns to complete and perfect combustion within its own area. Water (F) is circulated around the tube by a water circulator (E) and carries the heat to the house through the outlet pipe (G).

Many companies are now at work perfecting their own designs of equipment applying this new "Anthratube" principle under patent permits of Anthracite Industries, Inc. Patent papers have been filed both in the United States and in England.

Mining Research

The U. S. Bureau of Mines has two research projects in the production of anthracite. The Bureau is working with a committee of operators from each of the three anthracite fields, and from both large and small companies. Dr. R. R. Sayers, Director of the Bureau of Mines, is chairman.

Mechanization

The wartime need for anthracite has emphasized the necessity of improving and extending machine mining in the anthracite region. Since the mining companies working in the flat veins have extended machine mining as far as physical conditions and availability of mining equipment would permit, the possible methods of mining pitching seams are being explored. This work is under the immediate direction of Mr. John W. Buch, mining engineer, of the Fuels and Explosives Branch of the Bureau of Mines.

Flood Control

Flash floods constitute a recurring threat to anthracite mining operations, and normal mine drainage is becoming an increasingly acute problem for the entire anthracite region.

Under the direction of Mr. S. H. Ash, mining engineer, of the Fuels and Explosives Branch of the Bureau of Mines, some sample preventive cases of flood control projects are being examined with the aid of the producing companies in all three fields of the anthracite region.

New Uses

The efforts to develop new uses for anthracite continue on several fronts. Anthracite Industries, Inc., individual producing companies, Pennsylvania State College, and the U. S. Bureau of Mines are all making studies along many different lines.

The use of fine sizes as a coke-making blend has been explored and is now fairly well established in several plants.

Admixtures of fine anthracite with bituminous have received much study, and some very startling results have been achieved, particularly in elimination of coke trees and smoke.

Stream Pollution

Both State and Federal authorities are becoming increasingly conscious of stream pollution, and more stringent regulation and enforcement are to be expected.

The State Sanitary Water Board has a corps of men making tests of colliery waste waters both in the anthracite region and in the Schuylkill River basin. Dr. H. A. Stewart, State Secretary of Health, and chairman of the Sanitary Water Board, has been very active in this effort, and several companies have submitted plans for retaining the solids in the effluent water from their preparation plants.

Many companies have already taken steps toward a solution to this problem. Due to the critical nature of some of the material and equipment necessary to trap and prepare the solids in breaker water, it has been impossible for some of the companies to secure delivery on orders for pumps, plates for sedimentation tanks, conveyors, etc. However, it is hoped that priorities will be made available during the coming year so that this work can proceed.

Preparation

Of particular interest in the field of preparation is the new process of the Lehigh Navigation Coal Company for recovering fine sized anthracite and preventing pollution of the Schuylkill River.

The company anticipates a profit from the recovered coal and plans extending the reconversion system after a trial at its Tamaqua operation to operations at Coaldale and Lansford. The three plants will cost approximately $1,000,000 in all.

The process being used calls for the pumping of the mine waste water into a circular tank called a hydroclassifier, 75 ft. in diameter. The heavier solids settle and the water is transferred to another tank, 180 ft. in diameter. It is then churned and the sludge and water are separated. From the second tank the water is run to a third where the fine coal particles are separated from the water through a series of flotation tanks in which air has been introduced to produce a bubbling froth. The coal particles adhere to the froth and are piped into a dryer where they are forced to the cylindrical sides of the dryer by centrifugal force. The coal is later stripped from the dryer and conveyed to cars for shipment.

The Hauto Plant

Another interesting new plant was constructed during the year by the Hauto Coal Company, of Scranton. The new breaker, located at Hauto, Pa., was designed by the Wilmot Engineering Company in consultation with Pierce Management. The breaker is designed to take 300 tons per hour of bank feed and prepare it for market. The coal enters the breaker on a 10 x 36 in. double strand conveyor on 258 ft. centers and passes over a bull shaker and picking table. Crushers then reduce the lump to egg size and smaller. After sizing on shakers, varying from 5 to 8 ft. in width and 30 ft. in length, all sizes from egg to pea coal pass from the shakers into a Chance Cone for flotation. Buckwheat and rice coal pass directly into a 3 ft. 6 in. Wilmot hydrotator and thence over single deck de-watering screens to the storage pocket. Barley coal passes into a 6 ft. Wilmot hydrotator, thence over a two-deck de-watering screen to the storage compartment. No. 4 buckwheat passes into a 7 ft. Wilmot hydrotator and over a two-deck de-watering screen into the pockets. No. 5 buckwheat is treated in a 16 ft. Wilmot classifier.

The refuse from the cone and the four hydrotators and classifier is gathered to a refuse hopper and hauled away by trucks.

The overflow from the No. 5 dewatering screen passes to a rectangular settling tank 10 ft. wide and 110 ft. long, equipped with three baffles and a slow moving conveyor operating on an incline which removes the solids settled out of the silt tank, and delivers them to the breaker rock pocket.

This settling tank serves the purpose of a re-circulating water supply tank also because the breaker requires 3,000 gallons of water per minute with

(*Continued on page 93*)

Well balanced and easily handled, the extra powerful Cleveland SS22 always gets the round in faster. Many important features:

1. **TRIP ROTATION** enables rotation to be started or stopped at will, preventing "spinning" or accidents.
2. **AIR FEED RELIEF** provides control of feed pressure when passing through variable ground.
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BULLETIN 127 describes this stoper in detail, includes many views of its internal operating mechanism. *Write for your copy!*

The SS22 weighs 120 lbs. and is 59¼" long. 18" steel change. 1" air hose and ½" water hose.

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Hamilton Wright Photo

0,000 tons of bituminous coal and outgoing coke at the Clairton Works of Carnegie-Illinois Steel Corporation, world's largest oke plant. In the background one of a fleet of stern wheelers is pushing 5,000 tons of coal down the Monongahela River to plant

BITUMINOUS COAL—

In Retrospect and In Prospect

By R. E. HOWE

President
Appalachian Coals, Incorporated

TO DATE in World War II the peak of industrial production as reflected by the Federal Reserve Board Index was reached in October, 1943, at a level of 247. The year 1943 began with this index at 227 and wound up with it at 241. The year's average was 238.

The year 1944 began with the index at 243. The peak for the year was reached in February at 244. From that month forward there was a steady decline until the latest published figure stood at 230. It is anticipated that the Federal Reserve Index will wind up 1944 at approximately this same level. The year's average will likely be in the neighborhood of 235. Thus, for 1944, a decline of 13 points between January 1 and December 31 took place. The decline in the year's average indexes between 1943 and 1944, however, will likely be only three points which represents an insignificant percentage change. We hazard no guess as to the performance of this index during 1945, but we are of the opinion that the 1944 rate of decline will during the first quarter of 1945 be definitely arrested regardless of the fortunes of war.

Consumption of industrial coals is definitely reflected in the long-term trends of general industrial activity, as measured by the Federal Reserve Board Index. Likewise, but to a lesser degree, domestic and space-heating coal consumption fluctuates with this index by reason of increased or decreased earning power, as well as due to the number and locale of workers involved.

Wishful thinking which has been so prevalent in recent months relative to the early termination of the European phase of the war has been dashed upon the rocks of stern reality. It is the opinion of Appalachian Coals, Inc., that there are present or in prospect other factors of such importance as to largely outweigh the temporary effect of even such a desirable event as the surrender of Germany during the early months of 1945. Indeed, it may be that as the pages of 1945 unfold the eventual surrender of Germany will have little, if any, other than a temporary effect upon the American economic picture and the bituminous coal industry in particular.

It becomes more and more evident that even the cutbacks and recon-

versions in production of certain types of armament and of ammunition have proven a mistake. As the year 1944 drew to a close, the anticipated 40 percent to 50 percent drop in industrial production by reason of expected cutbacks in industrial production did not occur. Not only is this being rectified as the fortunes of war vaccillate, but additional plants are being constructed and changes made in existing production schedules to turn out new types of equipment and ammunition as well as additional quantities of the old. Reconversion which early in 1944 was a major topic of discussion, has been practically shelved except for limited production of certain light civilian items where no interference with wartime production seems to exist. The pace of postwar planning has slowed down considerably. The execution of such plans on any major scale are being held in abeyance, and rightly so.

In the light of developments, the stern job definitely ahead for the manufacturing and mining interests of the country for 1945 is, therefore,

War despite the fact that normal markets were seriously disturbed.

In 1944, monthly production reached its peak in May when the output was 55,220,000. This figure was again approached in August with its 54,220,000 tons production. Since that time the effect of a net loss in working forces and of a steadily rising age level among employes, and of continued absenteeism, plus much "tired equipment," has made itself felt. As a result, *weekly* production declined from an average of some 12,300,000 tons in the peak month of May to in the neighborhood of 11,900,000 tons during October. As the year-end approached, due to the prevalence of holidays and their somewhat prolonged observance, weekly production further declined. During December adverse weather conditions likewise affected mine output. Consequently,

The Year's Production of 620,000,000 Tons Not Likely to be Duplicated in 1945 Without Correction of Certain Adverse Factors

clearly defined, namely—the successful termination of the European phase of the war, with perhaps but a minor pause for readjustment of production schedules and for the purpose of rerouting of transportation, pointed toward the prosecution of a long and trying war in the Orient.

Bituminous Coal

In an article appearing in THE MINING CONGRESS JOURNAL of February, 1944, Appalachian Coals, Inc., said:

> "More coal will be required during 1944 than was produced in 1943. Unlike the monthly pattern of 1943, however, the peak for the year probably will be established during the first quarter, with the demand and required production gradually but slowly declining during the balance of the year."

In 1943, the 590,000,000 tons of bituminous coal produced constituted a new record. Consumption was likewise at record levels, amounting to in excess of 620,000,000 tons. Equitable distribution of this coal was a major problem. Generally speaking, it was well-handled by the industry representatives through cooperation with the Solid Fuels Administration for

1944 annual production on the basis of temporary estimates appears to have been approximately 620,000,000 tons.

Total 1944 consumption, plus export and miscellaneous, absorbed all this coal. With the possible exception of December, peak consumption took place during January, February, and March, with a monthly average of approximately 54,500,000 tons.

The distribution of this coal was likewise a major problem, but with the experience of the previous year, both the industry and the Solid Fuels Administration for War have done an exemplary job. The net effect of SFAW Regulation No. 23 appears to have been generally beneficial.

We hazard no guess as to likely bituminous coal production during 1945 other than to suggest that a continuation of the before-mentioned adverse operating factors, plus additional "tired equipment," if it is not soon replaced, will result in considerably less production than the high record of 1944. "New" production will prove definitely beneficial but we do not believe it will be sufficient to prevent a net decline in 1945 output versus that of 1944.

The best informed estimates as to 1945 bituminous coal consumption, assuming a continuation of the present emergency, indicate a figure not greatly different from that of 1944, but this can be nothing more than a guess. If this surmise should prove reasonably correct, the equitable distribution of available bituminous coal supplies during 1945 will for the third successive year prove to be a major problem. Of course, each month's shortening of the European phase of the war will lessen the demand for coal and thereby dissipate in proportion distribution problems. That the continued intelligent and patient cooperation of the industry, of the Solid Fuel's Administration for War, and of the consuming public will reasonably surmount such difficulties as may arise, we do not doubt.

1945 First Quarter Demand

As noted before for the first quarter of 1945, it is our opinion that general industrial production will increase, thus arresting the trend of the Federal Reserve Board Index from the estimated level of 230 for the month of December, 1944. Consequently, we anticipate that there will be increased demand for industrial coal during January, February and March. The over-all weather pattern which developed during the early part of 1944-45 heating season definitely indicated that greater-than-normal domestic and space-heating fuel requirements would materialize later in the season. The A.C.I.'s forecast to this effect, made last October 5, is already being borne out. Consequently, demand for domestic and space-heating coal during the first quarter of 1945 will likely average somewhat greater than the most recent ten-year normal as well as that of the corresponding months of 1944. Such a development, however, would likely result in a normal development of heating requirements during April, May, and June.

In the light of these factors, the over-all demand for bituminous coal during January, February, and March of 1945 will exceed the productive capacity of the mines.

Stocks

Stocks of bituminous coal at January 1, 1945, on the basis of preliminary estimates, no official figures having been issued at this time, will likely be in the neighborhood of 56,000,000 tons, approximately the same as January 1, 1944. Stocks in the hands of retailers, although about the same as of the same date last year, will probably be not more than half

the amounts normally on hand at January 1. This situation will likely pose an especially difficult task from the standpoint of equitable distribution. Should 1944 consumption prove to have been greater than the 620,000,000+ tons mentioned before, or production be less than 620,000,000 tons, stocks at January, 1945, could show a small decline.

1945 First Quarter Production

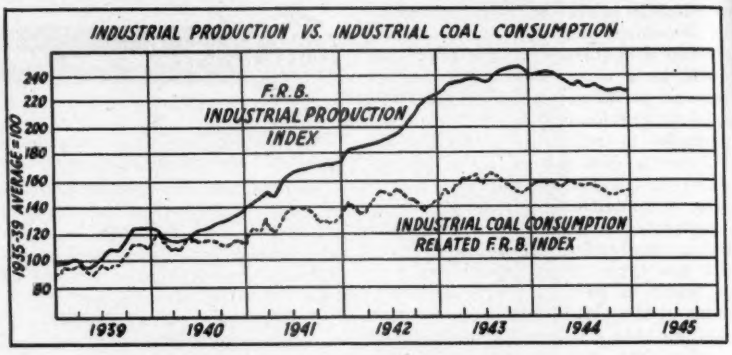
In the light of previously mentioned difficulties and assuming that near productive ability was reached during the month of October, 1944, it is our forecast for the first quarter of 1945 that both national production, District 8 output, and that of A.C.I. mines will be less than that of the corresponding quarter of 1944.

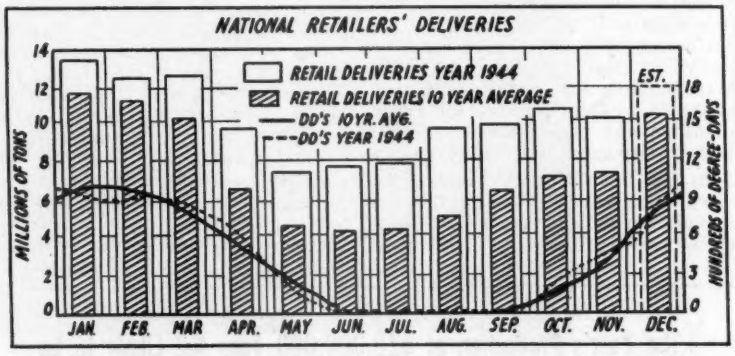
During January, February, and March, 1944, national production was 160,870,000 tons. We believe national production during the first quarter of 1945 will be in the neighborhood of 150,000,000+ tons.

During the first quarter of 1944, District 8's output was 31,946,000 tons. It is our forecast that during January, February, and March, 1945, production from this district will amount to not in excess of 29,000,000 tons.

A.C.I. mines during the first quarter of 1944, produced 8,015,000 tons. Giving effect to the trends now in existence, we expect the A.C.I. 1945 first quarter production to be somewhat in excess of 7,500,000 tons.

The declines indicated above for the country's mines, as a whole, and for District 8, represent about 5 percent when compared with the first quarter of 1944. In view of our conclusions before that general industrial consumption will be very substantial during the first quarter, and because we believe the over-all demand for bituminous coal will likewise be extremely active, the distribution of the available coal will bear close watching during the early months of 1945, in fact as long as the present emergency lasts.



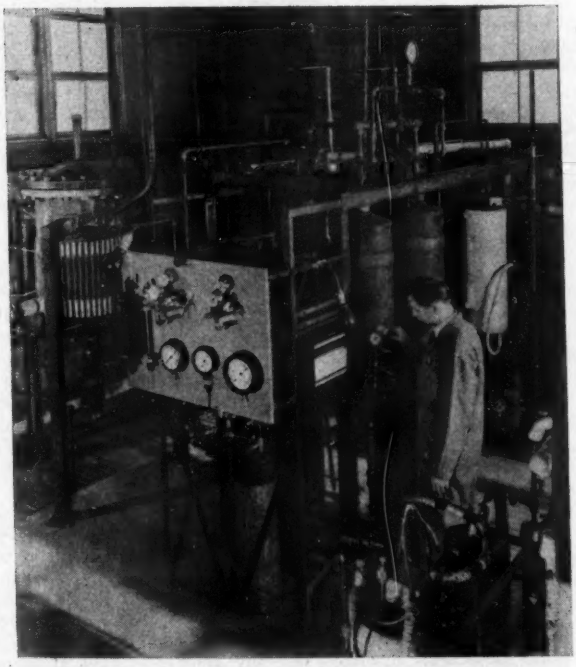


Hamilton Wright Photo

Retired bituminous coal miners who have voluntarily returned to work to help the manpower shortage in the Pocahontas area. Left to right: Jean LaRue, George Nipper, Aaron Kovak, Steve Chubby and Rufus Shaw

BITUMINOUS COAL RESEARCH

By HAROLD J. ROSE
Vice President and Director of Research
and
RALPH H. HOPP
Technical Information Division
Bituminous Coal Research, Inc.



U. S. Bureau of Mines single stage experimental unit for study of the Fischer-Tropsch synthesis

CURRENT research programs on bituminous coal include: smokeless combustion for all domestic and industrial uses, new coal-burning locomotives, improved pulverization and combustion, hydrogenation to produce motor fuel and chemicals, oxidation to produce acids, carbonization research to produce smokeless fuels and to utilize coals not hitherto used for coking, complete gasification, automatic equipment for residential heating, non-fuel uses, mining problems, improved preparation, etc.

There is More Interest in Coal Research at Present, and More Money Available for This Purpose, Than Ever Before. Many Research Institutions and Company Laboratories Have Expanded Their Coal Projects in Spite of the Shortage of Trained Personnel. Emphasis is Well Distributed Between Fundamental Research, Engineering Developments, and Commercial Application of Results.

Bituminous Coal Research, Inc.

A five-year program involving more than $2,000,000 for coal research and equipment development was initiated in 1944 by Bituminous Coal Research, Inc., with funds provided by leading coal producers and coal-originating railroads.

The administrative office was established in Pittsburgh, with H. J. Rose as vice president and director of research, and E. R. Kaiser as assistant director of research. Substantially all of BCR's research projects are assigned to existing research institutions, as detailed later. All phases of bituminous coal research are within the scope of this organization, but the principal emphasis is on studies and engineering development leading to more effective utilization of coal for industrial and domestic purposes.

In addition to this general research program, more than $1,000,000 has been paid into a special fund for coal-burning locomotive development, by leading railroads and Bituminous Coal Research, Inc. Owing to the magnitude and specialized nature of this project, it will be handled with separate personnel, and administered by a committee appointed by H. N. Eavenson, president. This work will not duplicate important locomotive research now in progress elsewhere.

Battelle Memorial Institute

Battelle is continuing its program of research on improved utilization of coal for Bituminous Coal Research, Inc.

Smokeless Domestic Hand-Fired Equipment.—As a result of field tests last winter with a manufacturer's version of the smokeless heater that had been developed, further improvements were made to insure consumer satisfaction. Several of the cooperating manufacturers are building or testing their experimental units and one of them has 35 units in field trial this season. Kitchen ranges, furnaces, water heaters, etc., will be built on the same principle. A calorimeter room has been installed for direct determination of the B.t.u. output of heaters.

Stokers. — Investigations are continuing on the factors influencing continuous ash discharge in the BCR rotary-grate stoker. Fundamental studies on stoker-screw corrosion revealed that causative factors include temperature of screw, moisture content and acidity of the coal, and nature of dustless treatment.

Dust-proofing of Coals.—Recent attention has been focused on the best means of dust-proofing coals having high bed-moisture.

Overfire Air Jets.—A new design of steam air jets with improved si-

lencing device has been developed for the elimination of smoke from both stationary boilers and steam locomotives. Following very successful trial installations by the Louisville & Nashville, and other railroads, a large number of these steam air jets have been installed on locomotives.

Locomotive Air Supply.—Preliminary studies have been made of the factors which influence the correct drafting of coal-burning steam locomotives, preparatory to large-scale tests.

Gasification.—Progress has been made in evaluating capacity factors with non-coking and mildly coking coals, in a gasification unit using pulverized coal.

Flow of Pulverized Coal and Air.—Means have been developed to measure the quantity of coal and air flowing in a pulverized-coal system. This provides a fundamental approach to the study of the effect of bends, Y's, and offtakes, on the flow.

Other Projects.—Additional projects include high rates of heat release and heat transfer from burning coal, central block heating for residences, and performance of new types of chimneys.

For other sponsors, Battelle has recently studied the application of coal to gas turbines, development of an improved coal pulverizer, the resistance to corrosion of specially-treated stoker screws, and the cleaning and burning characteristics of coals.

Carnegie Institute of Technology

The Coal Research laboratory continued, and in most cases expanded, work on its projects. Bituminous Coal Research, Inc., became a major contributor to this laboratory in 1944.

Reactivity of Solid Fuels.—No exceptions have been found to the conclusion that the reaction between oxygen and bituminous coal is not proportional to the partial pressure of oxygen.

Combustion of Pulverized Coal.—It was concluded that good combustion demands rapid ignition close to the burners, with temperatures generally above the ash fusion temperature. Work has been done on ignition, ash behavior, and an analysis of heat flow through slag layers.

Coal Hydrogenation.—An exploratory study has been made by chromatographic absorption methods to determine the relation between primary coal hydrogenation products, coal extracts and known hydro-carbons.

Coke Quality.—Work has begun on a procedure for preparing reproducible coke samples needed in developing a measure of coke quality based on physical constants. Published estimates of the value of cleaning coal for use in the production of blast-furnace coke, have been studied.

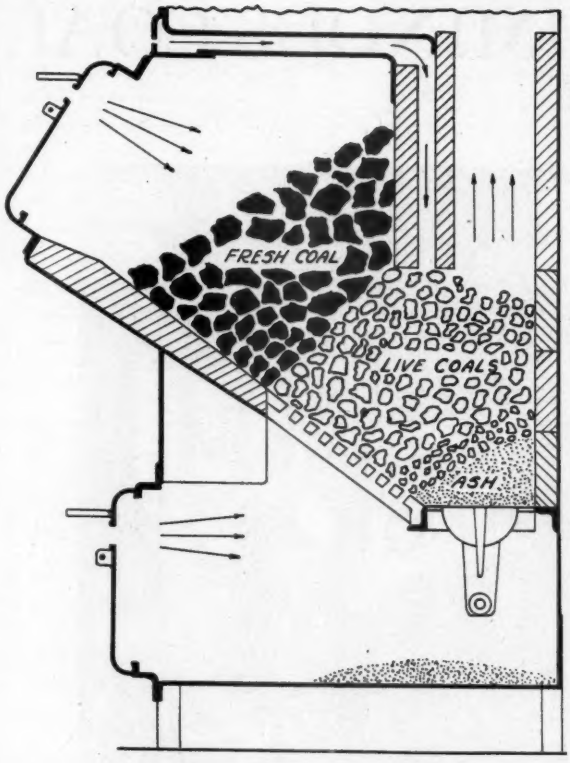


Fig. 1. Longitudinal vertical section of Fellows down-draft coking furnace showing condition of fuel bed after placing a charge of fresh fuel

Acids From Oxidized Coal.—Work continued for Mellitic Associates on the production of acids from coal by oxidation. Great improvements have been made in reducing reagent costs and increasing the rates of reaction. Much interest has been expressed in the potential value of such acids to the chemical industry.

Illinois State Geological Survey

Coal Resources.—Studies of oil-well drilling logs have furnished much information on No. 6 coal, especially in the deeper parts of the Illinois basin. Several workable coals amounting to more than 25 million tons have been revealed in this basin.

Coke From Illinois Coals.—In cooperation with the War Production Board and commercial coke-oven plants, an investigation has been made of southern Illinois coals for producing metallurgical coke. One plant in the St. Louis district has been coking mixtures containing 65 to 75 percent of such coal since April, 1944, and the coke has been used in blast-furnace operation.

An experimental electric slot-type oven holding 500 lb. of coal has been developed to the point where coke and by-product yields and properties agree closely with results from commercial coke ovens.

Evaluation of Stoker Coals.—Systematic tests have been made on 43 Illinois coals to correlate their behavior in domestic stokers with chemical analysis, physical properties, and banded ingredients. One objective is the preparation of better stoker fuels.

Smokeless Fuel.—A pilot-plant oven of the sole-flue type was built which matched the results of commercial ovens for producing smokeless fuel at moderate temperatures. Progress has been made in briquetting fine deduster dust at elevated temperatures and pressures.

Banded Ingredients of Coal.—Fundamental studies were made on the banded ingredients, including their relative moisture-holding capacity, the cause and nature of rapid weathering, the properties which affect their use, and if possible, an automatic method for determining their percentage in prepared coals.

Illinois University

A project to develop a principle of smokeless combustion for all types of high-volatile coal in hand-fired heating devices is being continued by J. R. Fellows and J. C. Miles in the Mechanical Engineering Division of the Engineering Experiment Station.

They report that the down-draft coking principle of combustion has been developed and proven practicable in numerous laboratory tests in which coal samples from every section of the country were burned. In a furnace, boiler, or stove which is designed to utilize this principle (See Fig. 1) each charge of fresh coal is gradually converted into coke in a down-draft coking chamber by the heat released from the slow combustion that is supported by the primary coking air. As the gases in the volatile matter of each charge are released

they pass under a baffle wall containing vertical air passages which are connected with the secondary air ports of the unit. This air is preheated in passing through the passages in the baffle and mixes with the gases as they pass under the baffle. The combustible mixture of air and gas is ignited by the hot coke from the previous charge, which is burned in the up-draft firepot below the baffle. When the fresh coal has all been converted to coke and the coke from the previous charge has all burned, as evidenced by the failure of the unit to respond to a demand for heat, the bank of fresh coke in the coking chamber is pushed back into the firepot and a charge of fresh coal is again placed in the coking chamber as illustrated.

Seven furnace companies have signed licensing contracts and one is constructing 100 units for field tests throughout the nation during the present heating season. A water heater incorporating the principle is now being perfected, and stoves and boilers will be developed as time permits.

Institute of Gas Technology

This new Institute, whose director is J. I. Yellott, is affiliated with the Illinois Institute of Technology.

Low-Temperature Carbonization.—Use of the "fluidization" technique to carbonize coal suspended in flowing gas is in progress on a pilot-plant scale. The Illinois Coal Products Commission is sponsoring studies to produce smokeless fuel and metallurgical coke from Illinois coal.

Coal Pulverization.—A new pulverization method for coal, coke, and other materials, is being developed, including its application in industrial operations, such as gas generation. Progress has been made on the removal of sulphur and ash from coal.

Gasification of Coal.—A comprehensive program on the gasification of coal is being developed in cooperation with the American Gas Association. Experimental work on gas production from coal, using fluidization and flash gasification processes, is under way. Hydrogenation of coal to produce a high B.t.u. gas is being studied.

Kentucky University

Low-Temperature Carbonization.—Based on 20 years of research on the low-temperature carbonization of coals, shales, etc., by C. S. Crouse, head of the Metallurgical Department, a pilot plant, costing about $50,000, is being erected with state funds.

This plant will have a capacity of 25 tons of coal a day, treated in a finely divided condition in contact with heating gases in an inclined revolving cylindrical retort. The solid product from coal will be smokeless fuel of controllable volatile matter, discharged through a water seal. Tar and motor fuel will be recovered and the fixed gas burned to supply the heat required by the process.

Koppers Company Research Division

Coal Carbonization. — The war emergency has necessitated many projects directed to manufacturing usable metallurgical coke from coals that were previously untried or considered undesirable. Coals from Oklahoma not previously coked commercially, have been adopted by two new by-product coke plants in Texas. As a result of development work in this country by-product coke ovens in Brazil, using Brazilian coal, will soon go into operation, and low-rank bituminous coals from Chile and Colombia, as well as higher-rank Mexican coals, are being tested for new coke plants in those countries.

Fundamental studies of coal carbonization and the effect of variables have been continued for the purpose of broadening the choice of coking coals which may be used in by-product coke ovens without damage from expansion.

By-Products.—New processes for extracting chemicals present in coal carbonization products were supplemented by research aimed at new uses for these products, including conversion into other chemicals.

Stokers.—Work continued on fitting coals to domestic stokers, and determining proper operating conditions. A fully-automatic domestic stoker for coke is now in successful use which further enhances the value of this smokeless fuel for house heating.

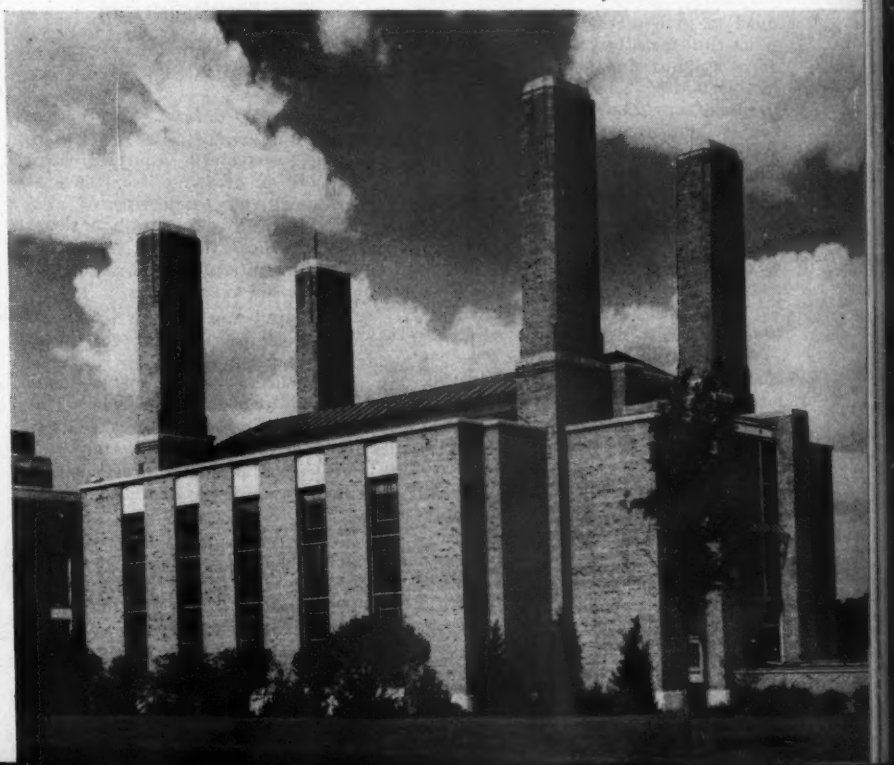
Pennsylvania State College

The School of Mineral Industries is conducting a number of projects on bituminous coal.

Domestic Stokers.—Extensive tests have been made on an automatic ash-removal stoker incorporating the pre-oxidation principle, which is now on field trial in several homes throughout Pennsylvania. Cooperative work on hold-fire controls has led to a design which is expected to maintain lower hold-fire rates than the usual time-lapse controls. When used to provide service hot water with a boiler-internal coil-storage tank combination, an adequate supply of hot water can be maintained (with no draw-offs) at hold-fire rates less than 0.5 lb. coal per hour.

Industrial Stokers.—The combustion of strongly coking coals on an industrial single-retort underfeed

Illinois Geological Survey's research laboratory for large scale experimentation



stoker has been systematically studied with respect to the effect of retort design, size consist and distribution of coal and use of the preoxidation principle. Progress has been made in perfecting a unit which will burn strongly coking coals without necessity of frequent barring and slicing of the bed. Blends of bituminous coal with anthracite fines have been made in both industrial and domestic stokers.

Non-Fuel Uses.—These investigations have included the preparation of ash-free colloidal fuel from mixtures of ash-free humic acids and oil; carbon black from humic acids; plastics by reaction of humic acids and various reagents. Also studies were made of the forms of nitrogen in bituminous coals and the humic acids prepared therefrom by nitric acid oxidation; the methane evolved on carbonization of different ranks of bituminous coal; the solvent extraction of indene and coumarone from coal tar fractions; and the preparation and use of the coal dyes extracted directly from bituminous coal by the Charmbury process.

U. S. Bureau of Mines

Owing to the exigencies of war, bituminous coal research by the U. S. Bureau of Mines has been increasingly directed towards more efficient production and utilization as related to the war effort. The emphasis has been on saving manpower and transportation facilities and answering pressing problems. Only a part of these activities can be reported in the space available.

Coking.—Methods have been developed to give increased production of mine-run metallurgical coal of uniform sulphur and ash content by selective mining, grading, blending and preparation. Lower rank bituminous coals from southern and western states have been examined for their carbonization properties.

The effect of oil additions to improve the handling characteristics of coal and to control the bulk density of coke-oven charges has been studied, as well as the use of anthracite fines to replace part of the low-volatile coal in coking blends.

Acid treatment of 1.30 sp. gr. float coal from several eastern Kentucky mines gives low-ash coal, which when coked will meet present specifications for impurities in calcined petroleum coke for carbon electrodes used in aluminum manufacture.

Gasification.—Tests with lignite and subbituminous coal in externally heated metal retorts have indicated the efficient production of high-hydrogen gas.

Storage.—Storage and combustion qualities of lower rank coals have been investigated and improvements made in storage conditions at coal docks and industrial plants.

Coal-Ash Slags.—Excessive deposition of coal-ash slags on water-cooled walls of large central station boiler furnaces is related to the flow characteristics of these slags in their solidification range. It was found that the temperature of critical viscosity, where liquid to plastic flow occurs abruptly on slow cooling, is affected in a complex manner by changes in the composition and state of oxidation of iron in the slag. A method was developed for calculating the relative thickness of slag deposits for typical conditions, thus enabling predictions of the behavior of different coal ashes on furnace walls.

Hydrogenation.—Substantial progress has been made in recent years at the Pittsburgh experiment station, on the fundamentals of producing synthetic motor fuels from coal. Both the pressure hydrogenation of coal-oil paste, and the Fischer-Tropsch synthesis from carbon monoxide and hydrogen, have been studied.

Public Law 290 of the 78th Congress recognized the importance of increased research and larger-scale development work on "synthetic liquid fuels from coal, oil shale, agricultural and forest products and other substances," and $5,000,000 was made available for the current fiscal year. Detailed designs and specifications have been completed for several units of pilot-plant size, which will be located at the Bureau of Mines' Experimental mine property at Bruceton, Pa.

West Virginia University

Two research fellowships sponsored by Bituminous Coal Research, Inc., are in progress.

Coal Mine Drainage. — Since few complete analyses of mine water were available, systematic analyses have been made on drainage from several coal seams. One objective of this analytical work is to obtain a satisfactory chemical yardstick for measuring the results of mine sealing and other proposed experiments.

Studies are being made to determine the relative importance of roof drips, sidewall and mine floor waters, etc., in contributing objectionable constituents to acid mine drainage. The final objectives are to reduce the quantity and acidity of mine water, and to develop satisfactory processes of treatment and disposal where necessary.

Control of Mine Roof Falls.—Field surveys, chemical analyses, etc., are being made with the objective of finding the causes and reducing the number of failures of mine roofs.

Canada Department of Mines

Canadian Coal Survey.—The Fuel Research Laboratories at Ottawa are making a physical and chemical survey of Canadian coals which includes not only the usual analytical data, but also the results of sizing, density, friability, and grindability tests, together with special washing and coking tests, and briquetting with and without a binder.

Increase of Clinkering.—A process is being investigated to impart varying degrees of clinkering to bituminous coals with high ash-fusion temperatures, to make them more suitable for domestic stokers.

Storage. — Coal storage problems, including investigations of newly advanced methods such as capping or sheathing with asphalt emulsions, etc., and also freezing characteristics of coal, and treatment methods for preventing freezing and consequent handling difficulties, are being investigated.

Hydrogenation. — Considerable research work on the amenability of different groups of bituminous and other ranks of Canadian coals to liquefaction by direct hydrogenation is being conducted, including both liquid and vapor phase reactions for the production of primary oil and high octane number motor and aviation gasoline.

Test Methods.—Research on methods of tests, with special reference to ash fusion temperature, friability, grindability, ignition, and reactivity on coal and coke are in progress in conjunction with the activities of A. S. T. M. Committee D5 and certain of its subcommittees.

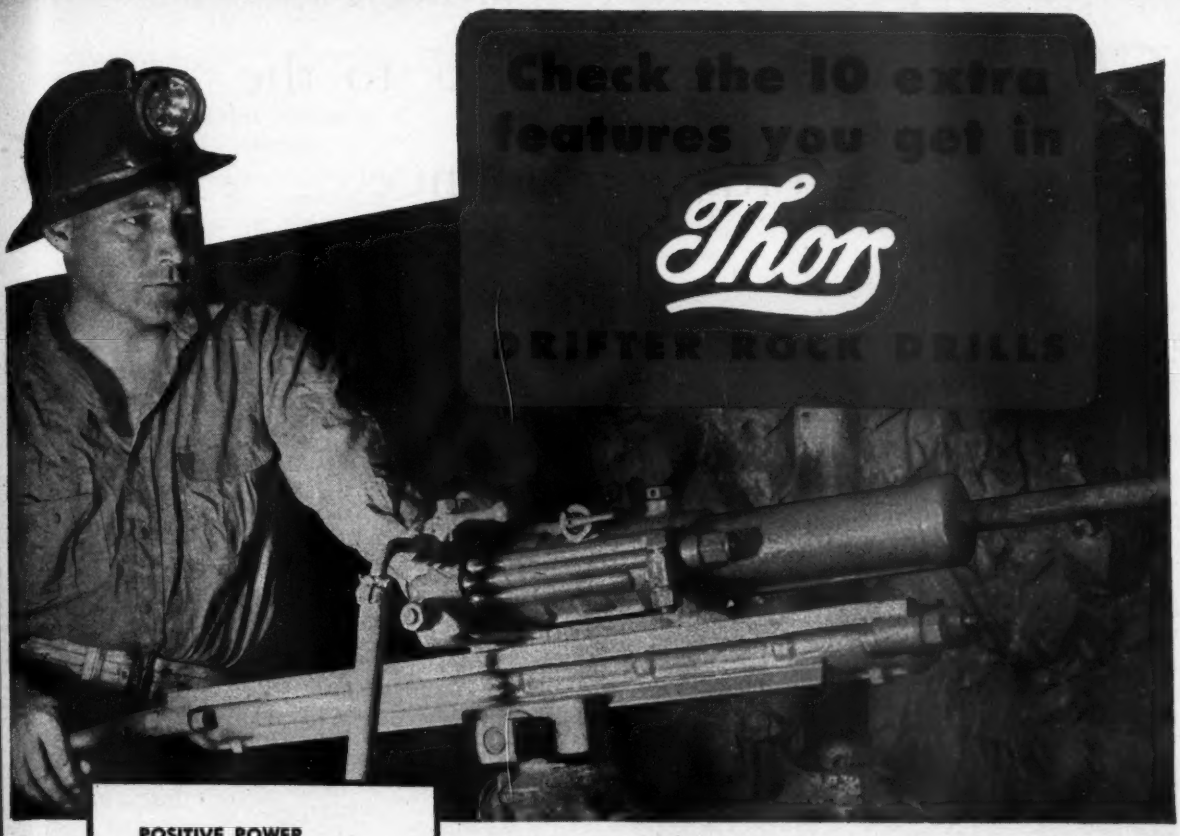
Space does not permit a discussion of coal research abroad. Much important work is in progress, especially in England.

The writers wish to express their appreciation to the following men who supplied most of the information used in this article: B. A. Landry, H. H. Lowry, M. M. Leighton, J. R. Fellows, A. D. Singh, C. S. Crouse, A. R. Powell, C. C. Wright, A. C. Fieldner, W. W. Hodge, W. T. Holland, and R. E. Gilmore.

In the May Journal—

COAL MINING LOOKS AHEAD

Don't Miss It!



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GOLD MINING Looks to the Postwar Era With Confidence

Again this year a carload of gold ore was donated by the mines in the Cripple Creek mining district, transported by the Midland Terminal Railway Co. and treated at the Golden Cycle mill, all free of charge, and the entire proceeds donated to the War Chest of Teller County. Pike's Peak in the background

While the gold industry of the United States and Alaska weathered another discouraging year, it faces the future with head unbowed if bloody, and looks forward to the brightest period in its history

By MERRILL E. SHOUP
President
The Golden Cycle Corporation

MORE than two complete years have passed since the War Production Board issued its Order L-208 which closed practically all producing gold mines in the United States and Alaska. Total gold production of the United States and Alaska continued its drastic decline during 1944. When final production figures are compiled for the year there is no doubt that 1944 gold production will show the lowest for decades.

Other Nations Continued to Mine Gold Throughout the Year

The principal gold producing nations of the world continued to mine gold during 1944 upon a restricted basis compared to previous years. However, this lower production was not due to any governmental edicts which closed the mines or curtailed their production, but was caused primarily by a shortage of labor, the inability to obtain materials and supplies, and the war with attendant adverse economic conditions.

The following tabulation, which shows the production of principal gold producing nations for 1937, 1941 and 1943, is extremely enlightening, especially the comparison of 1943 with 1941, since it clearly indicates the trend of our gold production compared with other nations of the world, and especially shows the damage caused by Order L-208 to our production. Our nation alone shut down its gold mines, while all others did everything possible to continue production, realizing that gold is and always has been, not only a sinew of war, but a bulwalk to build peace and prosperity upon.

When 1944 gold production figures are compiled the same ratio of production between nations as shown for 1943 will no doubt continue.

As time passes since the issuance of Order L-208 it becomes increasingly difficult, not only for the gold industry, but other intelligent persons, to understand why this order was ever entered. There no longer exists any argument that the benefit, if any, to the war effort derived from this order even slightly offset the damage done, not only to gold miners,

communities, etc., but to the nation itself.

A Few Gold Enterprises Continue to Produce War Materials

The few gold mining enterprises which were able to convert their specialized facilities for the production of war essentials carried on activities during 1944. The Cripple Creek Mining District, the Golden Cycle Mill and its affiliates continued to produce lead and zinc concentrates, forgings for planes and ships, power, coal, crushed rock and other essentials.

However, the larger part of the industry watched its gold mines stand idle, while heavy losses were sustained from expenditures to pump water, maintain shafts and tunnels, keep an organization together and pay insurance, taxes and maintenance costs.

The industry still bears the unique distinction of being the only one directly shut down by Government edict and is justly entitled, when the war is over, to a reimbursement of its losses by the United States Government.

Easing of Some Restrictions Under War Production Board Order L-208

During the latter part of 1944 the War Production Board issued a few modifications under Order L-208 designed to permit shut down gold mines to obtain some materials to rehabilitate properties so as to be ready to resume production when L-208 is rescinded. It is impossible now to state definitely what benefit, if any, the industry secured from these modifications.

The War Production Board also intimated that Order L-208 will be rescinded or modified when Germany is defeated or shortly thereafter. However, the optimism which existed about the defeat of Germany by the end of 1944 appears now to have been entirely unjustified. It now appears possible that our nation is headed again to a shortage of lead, zinc, copper and other strategic metals needed for the war effort. This fact, plus the demand of some war industries for thousands of workers, probably will adversely affect the possibility of an early rescinding of Order L-208 by the War Production Board and the reopening of the shut down gold mines.

Price of Gold Continues to Rise Elsewhere in the World and Foreign Nations Continue to Accumulate Gold

Gold continued to sell in other parts of the world at a premium. On black markets $35 gold sold for $45 to $50 in Cairo; $50 to $75 in Buenos Aires; and $50 to $75 in Bombay. Elsewhere abroad gold continued to command a decided premium in terms of local currencies and exchanges, including the American paper dollar. South African gold companies continued to hoard their production, holding it for a higher price which they feel certain will come reasonably soon.

Brazil has accumulated millions in gold from the United States; China the same; and every other nation in the world which has a chance to do so is digging into our supply. Leading nations are using every possible device to build up their gold supplies. The movement of gold out of the United States continued during 1944 at a rapid pace. From the all-time high gold reserves of $22,759,644,211.34 which the United States held on October 30, 1942, we possess (December 30, 1944), as nearly as can be estimated, $20,618,704,930.49, a decrease of $2,140,939,280.85 in our gold supply from the high point. There is every reason to believe this movement of gold out of the United States will continue at an accelerated pace since other nations realize the value of gold and are building up their stocks. Billions of our gold are "ear-marked" and belong to other nations to be returned with the advent of peace.

There now exists a theory regarding the gold we hold in Fort Knox and what we are doing with it which is best expressed by Henry J. Taylor in an article entitled "Uncle Sam Bleeds

GOLD PRODUCTION OF THE WORLD
(In fine ounces)
From *Year Book* of the American Bureau of Metal Statistics—1942-43

	1937	1941	1943
United States	4,753,104	5,980,746	1,365,223
Canada	4,096,213	5,345,179	3,652,263
Mexico	846,381	799,956	800,000
Central America and West Indies	140,000	330,000	300,000
South America	1,387,231	1,783,417	1,439,092
Europe	6,474,274	*4,500,000	*4,500,000
Oceania (largely British)	1,813,242	2,110,854	1,056,470
Asia	2,191,929	*2,760,000	*1,600,000
Africa	13,997,876	17,186,361	15,080,021

* Estimated.

Gold-bearing gravels in California normally contribute a major share of the country's production

Gold," ". . . and the United States alone among all the others is boondoggling with its gold." This scholar believes that the gold we own, instead of being a liability, as asserted by some managed currency and barter advocates, is the greatest asset we possess, not only to win the war, but to bring about the restoration of our postwar world and solve its economic problems.

The Bretton Woods Agreement Rests Upon a Gold Foundation

During July 1 to 22, 1944, the United Nations Monetary and Financial Conference was in session at Bretton Woods, N. H. Representatives of 44 nations were present and participated in the work of the conference under the leadership of Secretary Morgenthau. Out of this conference came the Articles of Agreement for an International Monetary Fund and International Bank for Reconstruction and Development; designed, among other things, to promote international monetary cooperation and to facilitate the expansion and growth of international trade with the hope of establishing a permanent worldwide postwar peace.

No attempt is here made to discuss the advantages or disadvantages to the United States if we accept or reject the agreement. Much will be heard about the Bretton Woods Agreement during 1945 since no doubt it will be presented to the Congress of the United States for its consideration. Debates, hearings and articles about the agreement will bring out all vital points involved.

Of special interest to the gold industry in connection with the Bretton Woods Agreement is the part played by gold. Gold becomes the measuring stick in payment of quotas, par value of currencies, "the Fund," and in other fundamentals set out in the Articles of the Agreement. If the Bretton Woods Agreement is adopted by all or a part of the 44 interested nations, so far as the gold industry is concerned the world will have adopted a financial and monetary plan based upon gold as the keystone. This fact, with the defeat of Germany, will help end the theories of barter and managed currency based upon foundations other than gold.

Employment for Returning War Veterans Must be Created by Private Industry

The President has pledged to the nation that 60,000,000 jobs will be made available when the war ends and that the bulk of these 60,000,000 jobs will be furnished, not from the dole, but from private industry.

Resumption of gold mining in the United States, Alaska and the Philippines will provide thousands of steady well paid jobs. Not only will employment be directly provided by the mining and milling of gold, but the accumulated demand for materials and supplies will furnish employment for thousands more.

Resumption of gold mining after the rehabilitation period is completed will mean resumption of dividend payments to stockholders. This money put into circulation will, in turn, help provide other employment of every type.

Gold Has Not Lost Its Value as the World's Most Desirable Monetary Medium and Never Will

Progress of the war and developments in connection with it have gone far towards allaying various ideas prevailing a few years ago concerning the "so-called" gold problem. The war has only served to re-affirm the age-old instinct of mankind in the use of gold as the surest means of preserving wealth. Never during the so-called civilized era has any other medium of exchange been developed which has the same desirable qualities of a monetary medium that gold provides. It exists in sufficiently large quantities to meet exchange needs, yet it is not so abundant as to lose its desirability. It is so durable that

Cripple Creek mines have long

it will not lose its exchange power through decay or deterioration; it can be divided into small units and used in transactions involving small or large amounts; it is homogenous and all parts or units have a uniform value and can be equally divided; it is portable and possesses cognizability; it has stability of value so that when contracts are made which involve the future payment of money both parties can have reasonable assurance that payments made in the future in gold will have the same absolute and relative position at the end of the contract as at the beginning. The eagerness with which gold has been sought through the ages clearly indicates that man's faith in gold has been maintained and it is this standard which makes gold the best monetary standard yet devised. There appears to be no recorded instance to date of any nation, even those operating under a barter or managed currency regime, where payment of an obligation in gold has been refused on the ground that gold had become useless and had no value.

Gold Mining Securities Show Confidence of Public in the Industry

Despite the fact that gold mines of the United States and Alaska, either did not operate during 1944 or operated upon a very restricted basis, it is interesting to point out that prices of most of the major gold mining stocks advanced in price during the year. This advance was not due to earnings or the payment of dividends by gold mining companies since practically all earnings or dividends have ceased until gold mining is resumed and plants rehabilitated, but must be based upon the confidence the investing American public has in the future of gold and the industry.

Even with the present depressed condition of the industry there now exists the largest amount of money for speculation and investment in gold enterprises for many years. This is especially true in the Cripple Creek Mining District at the present time.

The Canadian gold mines are experiencing the same situation, where the belief is prevalent that the post-war position of gold mining equities may be extremely advantageous from three points of view:

1. A return of peace will eliminate labor and material shortages, and permit operations at capacity rates.

2. If a period of credit deflation follows the war, gold mining companies will benefit since margin between costs and selling prices will be widened.

3. If the end of the war is followed by an increased price of gold, gold mines will benefit.

Gold Now is and Will Remain the World Monetary Medium

1. The war has checked the inflow of gold into the United States and will result in a better distribution of the world's supply.

2. Premiums commanded by gold in free markets have confirmed man's traditional faith in gold, showing that gold is still prized over all other currencies as a storehouse of value.

3. Gold must still be used for making international settlements.

4. The world's major nations have a huge vested interest in gold and will not abandon it.

Prosperity will return to the gold industry. The changed war conditions will delay it for a longer period than we hoped for in the early part of 1944. The industry looks ahead with confidence and optimism to the brightest period in the long and illustrious gold era.

factor in Colorado's gold production

SILVER—

By a SPECIAL CORRESPONDENT

RECOVERABLE silver produced in the United States and Alaska during 1944 was approximately 34,500,000 oz., as compared with 41,500,000 oz. in 1943, a decrease of 17 percent. The six states leading in the production of domestic silver were Idaho, Utah, Montana, Arizona, and Nevada, named in the order of the quantity of their production.

Of these major producing states there was a decrease in the mine production ranging from 15 percent in the case of Idaho, to 24 percent in Nevada, while increases occurred only in California, New Mexico, and Oregon, amounting to 25 percent, 15 percent, and 41 percent, respectively. The greatest decrease (85 percent) occurred in South Dakota.

While the exact production of silver in foreign countries in 1944 is unknown, it probably will not exceed 140,000,000 oz.

Silver imports during 1944 were probably less than in 1943, although the figures have not yet been released by the Government due to the exigencies of war. The chief cause of the reduced importations of silver in 1944 was the imposition by OPA of the low ceiling price on foreign silver of 45 cents an ounce. This action resulted in the diversion to other countries for coinage and bullion reserves of foreign silver which otherwise would have been consigned to war industrial use in the United States. Some silver shipped from Mexico to South American countries in 1944 was sold at 65 cents an ounce. The Treasury Bulletin for December, 1944, fails to reveal the acquisition by the United States Treasury of any silver, either foreign or domestic, during the calendar year 1944.

Congress made available large stocks of Treasury silver for war industrial uses under the Act of July 12, 1943. Wartime silver transactions accomplished so far under this legislation were summed up by Secretary Morgenthau on December 7, 1944, as follows:

"Provided for non-consumptive uses in war plants under lease arrangements, 903,000,000 fine oz.

"Supplied to various foreign governments under lend-lease for coinage purposes and other war uses, 243,700,000 fine oz.

"Sold from 'silver ordinary' stock to industrial users certified by War Production Board, 5,000,000 fine oz.

"Sold in accordance with WPB priorities . . . , 41,000,000 fine oz.

"For many of these uses," the Secretary continued, "copper previously had been required, and the substitution of silver released thousands of tons of copper for other vital war production needs. Development of the wartime 'silver nickels' using an alloy of silver lessened considerably the requirements of the Bureau of the Mint for both copper and nickel for coinage.

"Curtailment of Treasury purchases of silver also has contributed to the employment of the metal in war tasks. Practically all foreign silver received in this country since Pearl Harbor has gone into essential manufactures under WPB priorities. Domestically mined silver is made available in limited quantities under WPB control to non-essential industries, acquisitions of newly mined domestic silver by the Treasury (since Pearl Harbor) having been reduced to purely nominal quantities.

"Most of the Treasury silver distributed under lease to war plants has been fabricated into electrical conductors for installation in aluminum and magnesium plants and other factories engaged in war work . . . A small part of the silver turned over to the Defense Plant Corporation already has been returned to the Treasury with an 'honorable discharge' from its war duties."

The entire domestic output of 1944 was devoted to the manufacture of jewelry and other non-essential silver goods. The total industrial consumption of silver in the United States during 1944 was slightly in excess of 125 million oz., roughly two-thirds of which went into war-production channels and one-third into non-essential manufacturing. The use of silver in war industries is being expanded. As the war is prolonged, engineers are constantly developing new industrial uses for silver, many of which will be employed and further extended after the war.

Probably the greatest demand for silver in the postwar period will be for coinage purposes. There are some interesting stories to be told after the war (which cannot now be related because of censorship) which will reveal a new role for silver in connection with the invasion and reoccupation of many foreign countries.

More than 200,000,000 oz. of Treasury "free" silver were lend-leased during 1944 for "industrial and coinage purposes." In the case of India, which country has already received 100,000,000 oz. of this Treasury silver, it is interesting to note that the authorities in Bombay have established a practice of selling in the open market lend-leased silver in bars of 1,000 oz. each. These sales have varied from 200 to 1,000 bars a day

We are in the midst of an unusual situation which results from a greatly decreased production of silver and a greatly increased demand for silver for industrial and monetary purposes. The increased industrial demand comes largely from war plants and the manufacturers of "non-essential" silverware and jewelry. The increased monetary demand is reflected largely in domestic coinage.

and have been in progress for several months. The initial shipment of 100,000,000 oz. will soon be exhausted if that rate continues. It is quite probable that India will soon request additional shipments of Treasury silver for sale in the Bombay market.

Despite these large offerings, the market price of silver in Bombay in 1944 was confined to a somewhat narrow range of fluctuation—from 98 cents to $1.12 an ounce in United States money. The Indian authorities have been endeavoring to accomplish two purposes, namely, (1) to arrest inflationary tendencies by diverting cash (paper currency) into bullion silver, and (2) to force the market price of silver to lower levels. The natives continue to hoard silver rupees of sterling fineness, although these rupees of high-silver content were deprived of their legal tender status in 1942. The age old war between the authorities and the natives of India is still in progress. The attempt of the authorities to convert the natives to the use of paper money still meets with determined opposition.

On June 21, 1944, the following letter was addressed to the President of the United States:

The President,
The White House.

Dear Mr. President:

We have studied carefully the International Monetary Fund Plan that has been made public by the United States Treasury. Since whatever plan is ultimately adopted will have to be approved by the Congress, we feel it is our duty to pass on to you without delay certain conclusions we have reached pertaining to this plan.

The Experts' Plan suffers from a basic, organic defect in that no place in it is assigned to silver. As a result, there will be an insufficiency of media for the settlement of international balances, and the use of silver as money will be undermined.

We strongly urge, therefore, that the plan be revised forthwith so that parities for the currencies of member countries will be fixed in silver, as well as gold. By specifying fixed parities in terms of silver also, the following results would be attained:

1. The physical supply of standard money would be expanded for the enlarged needs of the post-war world.
2. The preference of a large part of the population of the world for silver money would be recognized.
3. The nations of Europe and the Far East now in the throes of wild paper money inflation could return to silver coinage on a sound basis.
4. The remonetization of gold and silver would thus be effected simultaneously and internationally.

Sincerely yours,

(Signed) ELMER THOMAS,
Chm., Special Silver Committee.
EDWIN C. JOHNSON.
PAT MCCARRAN.
SHERIDAN DOWNEY.
JAMES E. MURRAY.
ABE MURDOCK.
ERNEST W. MCFARLAND.
HARLAN J. BUSHFIELD.
E. V. ROBERTSON.
CARL HAYDEN.
MON C. WALLGREN.
GUY CORDON.
GERALD P. NYE.
J. G. SCRUGHAM.
B. K. WHEELER.
HUGH BUTLER.
HENRIK SHIPSTEAD.
DENNIS CHAVEZ.
JNO. THOMAS.
KENNETH S. WHERRY.
ELBERT D. THOMAS.
CHAN GURNEY.
CARL A. HATCH.
RUFUS C. HOLMAN.
D. WORTH CLARK.
E. H. MOORE.

The plea of these 26 Senators apparently fell upon deaf ears after the letter was referred by the President to the Secretary of the Treasury. No friends of silver were invited to attend the conferences at Bretton Woods. It is to be expected that an effort will be made to include silver along with gold in the International Monetary Fund (the word "stabilization" has been dropped) when the agreements come before Congress for consideration, probably in February. The opponents of silver will strive to defeat the effort of the proponents. It should prove a most interesting fight.

Subsidiary coinage of the United States is now at its all time peak, there being altogether $784,856,158 in halves, quarters, and dimes in the Treasury and in circulation (as of December 31, 1944). Also more silver dollars are now in circulation than has been the case since 1920. 115,413,498 silver dollars were in circulation on December 31, 1944. This reflects a rising popularity of the silver dollar during the past 12 years as only 29,176,799 silver dollars were in circulation on December 31, 1932.

The following changes have taken place in the quantity of various forms of United States money from 1933 to the end of 1944:

Silver dollars in circulation have increased four times.
Subsidiary silver in circulation has increased 2.86 times.
Minor coin in circulation has increased 2.35 times.
Silver certificates in circulation have increased 4.4 times.
Federal Reserve Notes in circulation have increased 6.3 times.
And the total money in circulation has increased 4.26 times.

The demand for silver money in the United States, Mexico, Great Britain, India, Australia, all of the South American countries, the liberated countries of Europe, Africa and the islands of the Pacific, is steadily increasing. The peoples of the less fortunate lands will in the future exhibit a greater enthusiasm for silver money than heretofore.

Senate Resolution 187, approved August 16, 1935, will terminate on January 31, 1945, unless extended by the Senate. Under this resolution, the Senate Special Silver Committee, as it is usually referred to, was established. This committee has been actively studying the silver question for nearly ten years and should be continued in existence. It is a well-known fact that neither the Senate Committee on Banking and Currency nor the Committee on Mines and Mining has for many years given any serious thought to this subject, which is of considerable importance to the mining industry as well as to the currency system of the United States.

Anthracite

(*Continued from page* 78)

only 1,000 gallons per minute being available. It also prevents stream pollution by trapping the solids in the breaker water. Another new feature of this plant is that all car load water and any leakage from the sand pumps or screens is gathered to a central sump at the bottom of the breaker and returned by vertical pump to the aforesaid settling tank, giving a complete recovery of all breaker water.

Not only is this plant noteworthy because of its complete recovery of fine coals, but also because the clean coals have a remarkably low ash. It is axiomatic that the finer the size of anthracite, the more difficult it is to secure maximum purity and recovery.

The Hauto plant was started in December, 1943, and operations commenced on June 26, 1944. The normal daily capacity is 1,000 tons per day of 14 hour operation.

Bauxite, Alumina and Aluminum Ingot

By ARTHUR B. MENEFEE

Assistant Chief, Materials Branch
Aluminum-Magnesium Division,
War Production Board

Midwest mines bauxite mine in Saline County, Ark.

By the End of the Year the Aluminum System Had Ample Stocks of Both Raw Materials and Primary and Secondary Ingot and Was Operating Considerably Below Its Installed Capacity

FOR many of those who have not closely followed the expansion of the aluminum industry throughout the world from the early pre-war period, it may be interesting to briefly trace the developments. Germany began to expand her aluminum industry during 1934 and by 1938 was producing at a rate greater than our domestic production and not a great deal less than the total United States and Canadian production. In spite of our private domestic expansion it was not until 1941 that United States production caught up and exceeded German production. From this time with the emergency expansion program coming into full effect our domestic production alone in 1943 was almost double Germany's total controlled supply, which included her own production and the production by conquest or alliance in Austria, France, Hungary, Italy, Yugoslavia and Norway. The Japanese started their aluminum industry in 1934 and have continued to expand it. Based on world production in 1943, the all time peak year, estimates show the United Nations (including the United States, Canada, United Kingdom and Russia) controlled 71.7 percent, Germany 21.5 percent, and Japan 5.6 percent.

Aluminum ingot production in this country reached its peak in October of 1943, but during 1944 there was a very substantial curtailment, which, of course, occasioned a similar reduction in the demand for the raw and accessory materials. Until these production cutbacks, the programs for the raw materials proceeded along the lines of the Government expansion program which began in 1941. An interesting development during the year was the fact that as raw material stocks and primary and secondary in-

got stocks increased, all restrictions and controls on the use of bauxite, alumina, cryolite and petroleum coke could be withdrawn by the revocation of their respective orders. Certain end-use restrictions were also withdrawn on aluminum ingot. By the end of the year the aluminum system had ample stocks of both raw materials and primary and secondary ingot and was operating considerably below its installed capacity.

Bauxite

In October of 1944 all allocations and restrictions on the use of bauxite were revoked. At this time Government and industry stocks at the current rate of consumption represented more than a year's supply and industry seemed entirely capable of taking care of the bauxite requirements in the future. As a result of an intensive prospecting campaign by the Bureau of Mines in cooperation with the United States Geological Survey, known bauxite reserves have more than kept pace with production although they are of a somewhat lower grade. New processes have been developed and are being put into practice to efficiently utilize this lower grade ore. Domestic production for 1945 is estimated at about 35 percent of the 1944 production. If necessary this could be increased three or four times on six to nine months notice. Conditions are entirely satisfactory to meet all anticipated requirements with safe working stocks on hand.

Government-owned bauxite stocks began to be accumulated about the middle of 1942 and by the end of 1943 were over 2,000,000 long dry tons. It is estimated that these Government stocks will be approximately 3,000,000 tons December 31, 1944. The original anticipated program for the build-up of Government bauxite stocks did not anticipate this amount. This increase is accounted for primarily by the cutbacks in the aluminum program and the inability to cancel immediately without penalty the existing Government purchase contracts. Total bauxite stocks (Government and industry) are estimated at 4,250,000 tons at the end of 1944, or approximately the same as at the end of 1943.

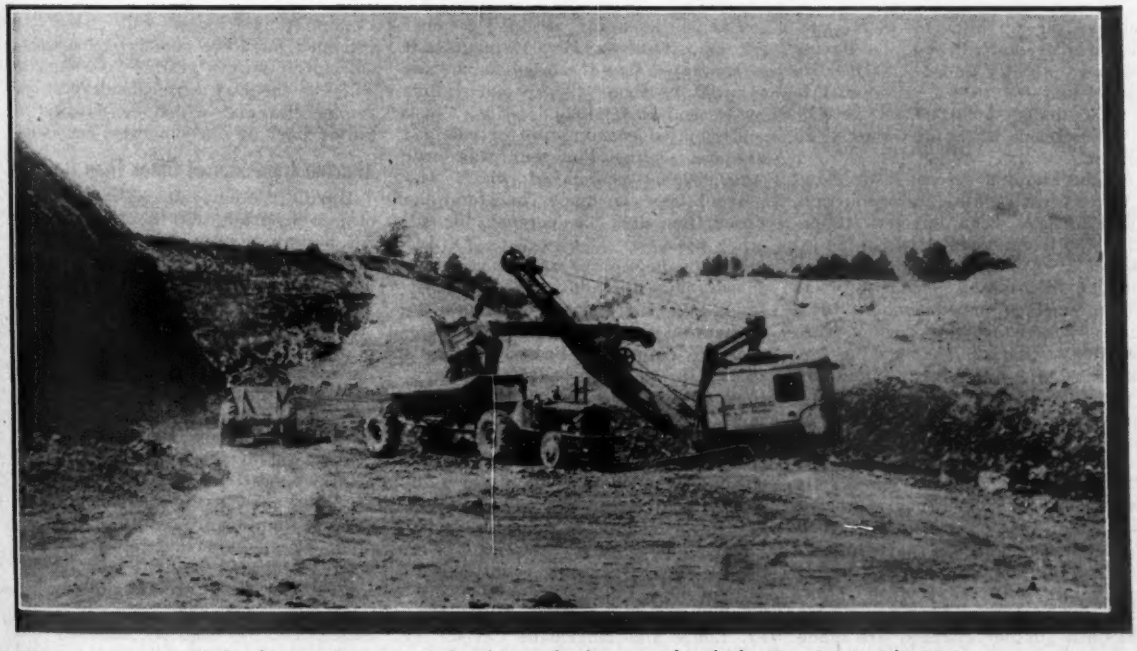
Non-availability of shipping space due to more urgent requirements elsewhere, largely controlled bauxite imports during 1944. Estimates indicate the receipt of approximately 560,000 long tons or about 35 percent of the previous year. These imports together with domestic production gave a total United States supply of a little less than 3,500,000 long tons or roughly 44 percent of the total United States supply for 1943.

It is estimated that the total bauxite consumption for 1944 will be slightly under 3,500,000 long dry tons, which is about the equivalent of the total supply. Of this consumption 88 percent was consumed for the production of alumina, 7.3 percent for abrasives and refractories, 3.9 percent for chemicals, and 0.8 percent for all other uses. No bauxite was exported during the year.

Alumina

With an ample bauxite supply and the alumina plants operating well below their capacities, all allocations and restriction on alumina were withdrawn by the revocation of General Preference Order M-1-h on October 23. At the end of the year only one Government-owned alumina plant (Hurricane Creek, Ark.) was operating. On a month's notice production could be increased and in six months production could be raised to close to the peak of the war emergency program providing power, labor and chemicals were made available. A small amount of alumina produced from alunite at the Kalunite plant, Salt Lake City, Utah, is the only production of alumina from the treatment of raw materials other than bauxite. The operation of the Combination Process (Bayer plant plus lime-soda-sinter) is making steady progress. Conditions as regards alumina as a whole are entirely satisfactory.

Domestic alumina production reached its all time peak in October, 1943. Since that time, cutbacks have



Modern large equipment is employed in overburden removal in the bauxite mines in Arkansas

Draglines are employed in bauxite mines to handle part of the stripping job

followed the curtailments in the aluminum program. Production during 1943 was slightly under 4,000,000,000 pounds and for 1944 is estimated to be just under 3,000,000,000 pounds, or a decrease of approximately 25 percent.

As the alumina system is operated in balance with aluminum production, cutbacks have been effected as required with due regard to the maintenance of safe stocks. The first curtailment in alumina production was put into effect in November, 1943, primarily to reduce stocks which were excessive at that time but looking forward to an anticipated aluminum production cutback. In July the Government-owned alumina plant at Baton Rouge, La., was closed down. At the end of the year the Alcoa-owned East St. Louis and Mobile plants, the Reynolds-owned Listerhill plant and the Government-owned Hurricane Creek plant were operating at approximately 42 percent of the total installed capacity. Operations will probably continue at this rate until further changes are made in aluminum production.

Calcined alumina stocks December 31, 1943, were 488,900,000 pounds. It is estimated that these will have been reduced to about 290,300,000 pounds by December 31, 1944.

Estimated consumption of calcined alumina during the year was over 3,000,000,000 pounds of which 94.5 percent was consumed for aluminum production and 5.5 percent for all other uses.

At the beginning of the year the Sinter plant installations at East St. Louis and Hurricane Creek began experimental operations. Red mud discharged from the Bayer plants is treated in these installations and in combination with the Bayer operations constitute the Combination Process, which effects the recovery of 60 to 70 per cent of the alumina formerly sent to waste. The Sinter plant additions at Baton Rouge and Mobile will not be completed immediately but all of the necessary equipment is on the ground. Operating conditions, in spite of many difficulties, have steadily improved during the year at both East St. Louis and Hurricane Creek. It now seems safe to predict that the Combination Process will fulfill its intended purpose, namely, to process efficiently lower grades of bauxite which in the past were considered noncommercial and which constituted a major part of our domestic reserves.

Alumina from Sources Other Than Bauxite

During the early stages of the aluminum program, with none too plentiful bauxite reserves and the uncertainty of imports from the Guianas due to submarine activities, a Government program was initiated to construct four experimental alumina plants to process aluminous containing materials other than bauxite. The plants are designed to produce 50 to 100 tons of alumina per day and are all Government owned.

The first of these to begin experimental operations was Kalunite, Inc., at Salt Lake City, Utah, designed to produce alumina from alunite and this plant began experimental operations about September, 1943. The process contemplated the production of alumina and potassium sulphate. Many difficulties have been encountered and its production record is not impres-

sive. All calcined alumina from the operation is being shipped to the Government-owned aluminum reduction plant at Tacoma where it is being successfully reduced to metal.

The Ancor Corporation has completed construction and is now beginning experimental operations at Harleyville, S. C. The raw materials for this plant are locally procured clay and marl, which are to be treated by the lime-sinter-soda leach process as developed by that company.

At Laramie, Wyo., the Monolith Portland Midwest Cement Company is constructing an experimental plant, and it is expected to start operating in April or May, 1945. Anorthosite and limestone produced locally will be treated by the lime-soda-sinter process as developed by the Monolith Company's engineers. The residue discharged from the plant, after the alumina has been extracted, will be sent direct to the adjoining Monolith-owned cement plant.

The fourth plant is located in the Pacific Northwest at Salem, Oreg., and will treat various clays of that region. The Chemical Construction Corporation of New York has developed the process and is constructing and will operate the plant during the early experimental stage. After this stage the operations will be turned over to the Columbia Metals Corporation. The design of the plant is for an ammonium sulphate process and its experimental operation will begin sometime during the spring of 1945.

Aluminum

In August, 1944, the general aluminum situation was such as to allow the end use restrictions to be withdrawn. Primary aluminum production reached an all time peak in October of 1943, with a production almost equal to the peak installed capacity. The total production for that year represented approximately 42 percent of the estimated world production. It was not until May, 1943, that Government stocks began to accumulate; but with the built-up production, a reasonably safe Government stockpile had been reached by the end of the year when the first cutback in aluminum production was put into effect. The Government stockpile continued to increase during the early part of 1944, and as requirements were not absorbing the then available supply, other cutbacks were effected in May, June, August and September. The estimated total production for 1944 shows a decrease of about 16 percent as compared with that of 1943 and at the start of 1945 the aluminum system will be producing at approximately 48 percent of its peak installed capacity. Unless conditions radically change, it is reasonable to expect that the system will continue to operate at about this rate during perhaps the first quarter of 1945. Of this production, privately owned plants are producing approximately 70 percent and Government-owned plants 30 percent.

The estimated Government stock position of primary and secondary ingot at the end of 1944 indicates that there will be something over one-half billion pounds on hand. At this time Government primary and secondary stocks were still increasing slightly but it is expected that early in 1945 the stock curve will level off and gradually fall.

As a whole the aluminum expansion program which was started in 1941 has been carried through to completion in an entirely satisfactory manner. As requirements since the middle of 1943 have not absorbed the available supply, comfortable stock positions in bauxite and primary ingot have been attained and all of those connected with the aluminum industry have reason to feel proud of its achievements. It goes without saying that without the whole-hearted cooperation of industry as a whole and the able handling of the Aluminum and Magnesium Division of the War Production Board by Arthur H. Bunker, former director of the Division; Philip D. Wilson, also a former director; and the present director, George C. Heikes, these achievements could not have been possible.

MAGNESIUM

Many New Postwar Uses are Being Forecast for This Light Metal Which is at Present Well Over the Production Hump.

By ARTHUR LOWERY
Major, Air Corps, U. S. A.

THE nature of the magnesium problem began to change in 1943 and continued the change in 1944. Efforts formerly devoted to curtailing uses for the metal and promoting production now are devoted to curtailing production and promoting uses. The early war years emphasized the engineering problems involved in getting an immense increase in production by several processes, some of which had not been worked out on a commercial scale. Construction problems involved in the building of immense plants requiring many critical materials were so complicated and loomed so large it was difficult to imagine the production of these plants would be surplus in so short a time.

The major reason for the existence now of surplus plants is the great reduction in incendiary bomb requirements. A large portion of the total requirement which justified the almost 600,000,000 lbs. per year of magnesium metal capacity dropped off in 1944, leaving the metal plants designed to supply it as superfluous as many of the bomb-casting plants intended to cast the bombs themselves.

Magnesium's War Record

The figures in Table 1 give an indication of magnesium's war record. 1940 and 1941, although chronologically pre-war years, actually, in magnesium, were largely devoted to defense production, for this country and England.

1941 metal production of some 33 million pounds stepped up from about 12.5 million pounds in 1940 and about 6.7 million pounds in 1939. Much of this metal was shipped abroad. Accordingly, in thinking about the early postwar future of the metal it must be remembered that the actual use of magnesium in the United States probably was less than 5 million pounds in 1939.

As the figures show, metal shipments and production in 1944 had gotten over the hump, and a sizeable inventory began to be built up. It is hoped this inventory can be kept to a reasonable figure. At the same time metal plants and alloying facilities must be kept going in some measure in order to provide insurance against a possible rapid increase in war demands for various alloys. Many

TABLE 1—MAGNESIUM PRODUCTS ('000 Pounds)

Year	Production of Metal	SHIPMENTS					
		Metal	Sand Castings	Permanent Mold Castings	Die Castings	Sheet	Extrusions	Forgings
1941*....	33,092	32,500	11,142	300	564	361	321	13
1942	105,861	109,194	32,292	1,364	1,304	879	416	42
1943	390,870	361,350	59,123	3,978	2,866	1,680	1,029	227
1944*....	367,931	316,671	75,626	6,412	2,355	2,318	9,165	393

* Estimated, from incomplete reports.
Data from Statistics Branch, Aluminum and Magnesium Division, WPB.

forms and alloys of ingot are used, and alloying facilities must be maintained to convert the raw metal into those ingot forms rapidly and flexibly.

Government Plants

Of the 11 Government plants built, all are closed down now except three: New England Lime Company, Canaan, Conn., Magnesium Reduction Company, Luckey, Ohio, and Diamond Magnesium Company, Painesville, Ohio. The first two produce their magnesium by reducing calcined dolomite with ferro-silicon, while the last uses the Dow cell for the electrolysis of $MgCl_2$.

Problems in 1944 and increasingly the problems of 1945 are in development engineering rather than production engineering. Since many of the metal plants now are shut down, the amount of engineering devoted to metal production has diminished greatly during the past year. Such activity as is maintained now is devoted to brushing up on fine points and making small improvements and adjustments in processes already well established. Increasing attention and engineering manhours are being devoted to problems of fabrication and utilization.

One of the war's biggest hauling jobs was the moving of magnesium ore from Gabbs to Las Vegas, Nevada

Research Continues

A great deal of research interest, new equipment and techniques are appearing in the fabrication field. The largest installation in the world, it is believed, for continuous casting of magnesium slabs and billets was put into operation in 1944 by Revere Copper and Brass at Baltimore. The thinnest magnesium alloy sheet in commercial production, approximately .010-in., was rolled by Weirton Steel at Weirton, W. Va. The country's largest extrusion press, rated at 5,500 tons, was put into operation on magnesium by the Dow Chemical Company at Midland, Mich.

The largest die-forging press in the country, and possibly in the world, was authorized by WPB. The press, estimated to weigh 5,000,000 lbs., will be built by the Mesta Machine Company, Pittsburgh, Pa., and will be operated for the Defense Plant Corporation by a subsidiary of the Wyman-Gordon Company, Worcester, Mass. The press is intended primarily for large magnesium forgings, but will be used also for heavy forgings in aluminum or other metals where its pressure may be required. An illustration of the size of the press is the fact that one of the castings for it was limited by the railroad clearances on the route from Pittsburgh to Worcester. It is said there are only three freight cars in the country capable of carrying this casting.

Future Expansion Possibilities

The volume of magnesium forgings produced is still insignificant compared with production of aluminum forgings, but a gathering momentum of improved techniques, and sales emphasis and interest in forgings promises a future expansion of this field greater, perhaps, than any other magnesium product. All but one of the forge shops on magnesium took it up after having been in aluminum. The tremendous demand for aluminum aircraft forgings kept them more than busy into 1944. Then as their production problems eased off they began to devote more time to magnesium. Previously, it had been thought that for the most part magnesium must be forged slowly, as in a press, and under relatively great pressures. During the past year this idea lost some ground as hammers were used successfully on a variety of jobs and alloys. A combination of press blocking and hammer finishing worked out well in many cases, while others were found practicable to be handled entirely on hammers.

A new sheet alloy, with approximately 5 percent aluminum and 1 percent zinc was put into production, which promises greater strength than the older 1 percent manganese alloy, with less susceptibility to stress corrosion cracking than the 6.5 percent aluminum alloy. The new alloy should be of considerable service to designers of light-weight fabricated metal components. It affords them the light weight, strength and stiffness they need, and at the same time reduces the special handling required in the shop.

Surface Finishes

Surfaces finishes received increased attention and indications are that several new finishes will shortly appear which will greatly increase magnesium's utility. More data on magnesium's corrosion resistance was brought out during the year, which indicated that the corrosion problem in many applications had been exaggerated. Significant service data from military experience are beginning to appear, providing a firmer basis for judgments in new designs.

Casting Problems

Requirements for castings eased up some during the year. Foundry operators, many of whom had never handled magnesium before the war, found time to improve and refine their practice, as well as reduce their costs.

A number of problems, such as micro-shrinkage in castings, the proper alloys for particular castings, improvement of stress corrosion properties of sheet, and many others, were taken up in research projects under the supervision of the War Metallurgy Committee. These projects bring together representatives of the industry, of the customers, and other interested groups, to combine their knowledge and experience on specific problems.

The Magnesium Association

The Magnesium Association got off to an enthusiastic start last year and is carrying on a number of essential activities with the industry. It provides a common meeting ground for the different members of the industry contributing to the interchange of data and practices which are required for the fastest advancement of the industry. Studies of new applications are being made and the ideas of many potential producers are combined. One of the important services of the Association is to organize the collection and recording of service data on various applications. The amount of such data now available is small relative to other materials. This limitation is a brake on the use of magnesium for new purposes. The prospective user requires illustrations of similar uses and their experience before proceeding with his own idea.

One development of outstanding importance is the increased intelligence regarding magnesium's fire hazard. As millions of pounds of the metal are used month in and month out successfully, and with little or no difficulty, the exaggerated suspicions of its inflammability are allayed.

Magnesium Fire Hazard

All specific control of magnesium was removed by the War Production Board in October. This means that magnesium may be bought and used for any purpose whatever, without restriction by the War Production Board. For obvious reasons, any increase in civilian magnesium consumption has not been very noticeable since these controls were removed. Design engineers available for such applications are yet scarce, as are the necessary companion materials and shop labor.

Designers and fabricators who are experienced in handling magnesium are either loaded with present work or are geographically inconvenient for prospective customers. Some effort is being made by the industry to encourage new fabricators to take on magnesium and learn its ways in order to remove this bottleneck.

In spite of the handicaps on the tonnage of new products manufactured, the number and variety of new developments is significant. The major companies in the field recognize that the progress of magnesium in structural uses is unlikely to be sudden or revolutionary, but will require great amounts of engineering time and money on specific applications.

War Products

By far the most of the structural products (castings, forgings, etc.) in the war have gone into the aircraft program. One exception is the sudden spurt in extrusions in 1944, caused by the adoption of extruded tubing for airborne rocket launchers.

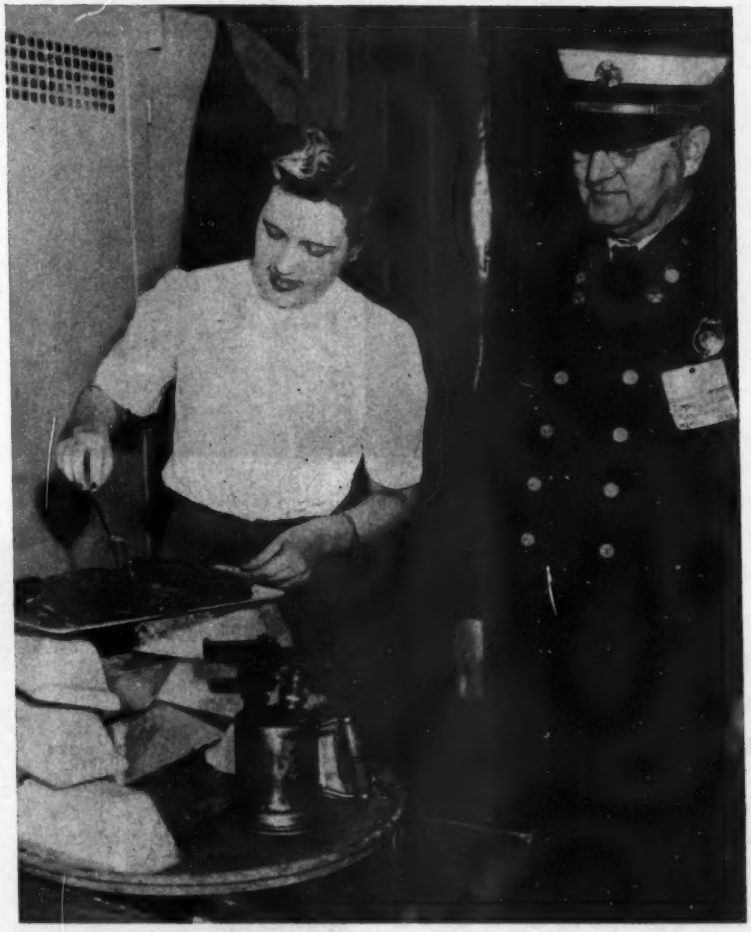
War products other than aircraft are being lightened as airborne operations for all branches of the service become more and more prominent. Engineer corps equipment, ordnance equipment, medical equipment, these and many others are looking toward magnesium as a means of increasing their portability.

Developments include artillery trails, gun carriages, machine gun mounts, artillery wheels, and additional applications still under military restriction.

The engineering of new uses has been speeded up in fields other than direct war equipment. Dow obtained permission to build several hundred magnesium wheelbarrows and also are proceeding with magnesium pancake griddles. This latter is not as new an application as might be supposed. Dow have had such pancake griddles in successful operation for over ten years.

Magnesium canoes, bicycles, and baby carriages are being exhibited. Several magnesium trucks and trailers are in operation. Work has begun on some magnesium buses. Textile machinery, conveyors, food machinery, foundry equipment are among the fields into which magnesium has gone during the past year.

The producers are carrying on intensive and realistic market development programs, and say there is hardly any product without its magnesium possibilities. The competition with other materials, old and new, is keen and unpredictable. The essentials now are sales engineering, trial and service data. Magnesium's history has been largely in the hands of the production engineer; it is now in transition to a future to be outlined not only by the production man but in large measure by the sales engineer.



A magnesium grill and a pile of pure magnesium ingots heated by a blow torch proved the fire-safe characteristics of the metal to fire fighters attending the 17th annual Fire Department Instructors' Conference at Memphis

Antimony

By R. G. HALL
Bradley Mining Company

A small pilot plant is being tried out by Bradley Mining Co. at Stibnite, Idaho

The Prospects for an Increasing Demand for Antimony Are Good—Improved Metallurgy Producing An Arsenic-Free Product Will Further Widen the Field

EXCEPT during war periods the mention of antimony in annual reviews of mining and metallurgical developments has been rare indeed.

The lead ore smelters of the United States produced as a by-product from lead refining a small tonnage of antimonial lead, usually containing about 10-20 percent antimony which was used in the production of certain white metal alloys such as printer's metal and bearing metals. The small amount of prime metal used in the United States, generally not over 5,000 tons per annum, was imported from China. Occasional deposits of ore containing commercial quantities of antimony were found here, but there were seldom any buyers.

In World War I the demand for antimony for shrapnel was for a time enormous and the demand of 21,000 tons of metal annually at that time was met by supplies from China, supplemented by ores and metal from Bolivia and Mexico. Only meager quantities were supplied by United States mines.

Following 1920 the United States consumption never fell off to the old figure of 5,000 tons and averaged more nearly 10,000 tons per annum of prime metal or ore contents, except during the period 1930-1935.

During the present war our importations have far exceeded any previous records and amounted to over 28,500 tons in 1941, and increasing amounts in subsequent years.

Since the Chinese supply has been cut off the excessive demand has been met by ores from Mexico and Bolivia.

American Production and Metallurgy Developments

The most significant domestic developments in both ore supply and metallurgy have been the increasing production from the Yellow Pine District in Idaho which during the last three years has produced in ores and concentrates in excess of 5,000 tons of metallic antimony contents annually. Other significant production has come from the tetrahedrite ores of the Coeur d'Alenes.

These ores of Idaho, almost all marketed in the form of flotation concentrates, also contain in most cases both silver and gold in significant amounts, most of them contain arsenic in nuisance amounts and call for the development of new methods of metallurgy.

Hitherto the imported ores reaching the United States were for the most part of high grade, about 60 percent, and usually in lump form from hand picking. Arsenic, a most objectionable impurity in metallic antimony, was low or absent. Old methods of liquidation and reduction were simple and inexpensive.

In the Coeur d'Alenes the treatment of the high silver tetrahedrite concentrates was solved by the Bunker Hill Smelter with the production of electrolytic antimony of high purity. The concentrates of the Yellow Pine District, containing about 50 percent antimony as stibnite together with gold and silver proved amenable to a simpler metallurgy.

It is however of great significance that there has been developed in Idaho a source of antimony, which, while insufficient to supply the full peacetime demand in the United States, will make us less dependent upon importations which may at times be interrupted.

Uses for Prime Antimony

Uses for prime antimony have slowly developed.

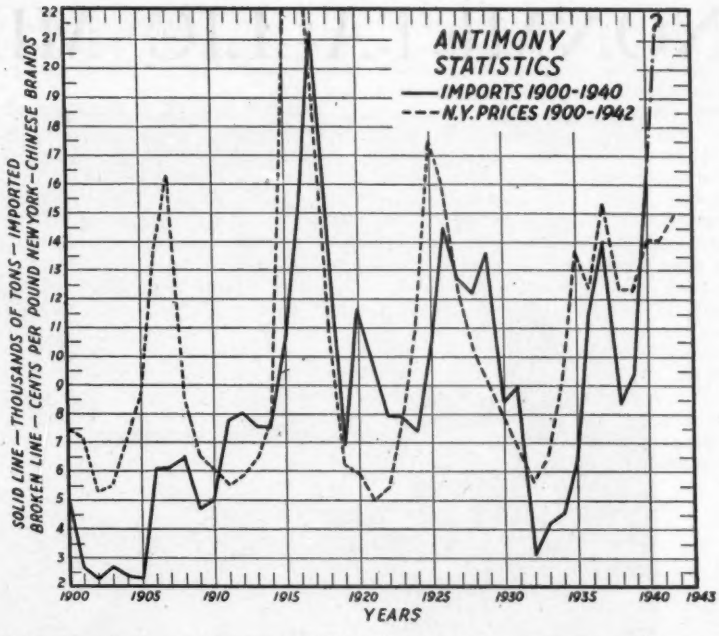
1. *Manufacture of bearing metals* and printer's metals. The hard lead of the lead refiners is of considerable use for these, but has almost always been insufficient. Some prime antimony has always been in demand.

2. *Storage batteries for automobiles* probably created the first large new and increasing outlet. For this purpose a low arsenic metal is desirable, and the lead refiners antimonial lead does not always meet the specifications. No doubt when post-war conditions permit automobile production there will be an increasing demand which will continue into the future, probably greatly exceeding the pre-war demand.

3. *Pigment.* Antimony trioxide has long been used for this purpose to a limited extent. It has been found of value as a heat-resisting pigment for automobiles following the use of the Duco lacquers and paints. No doubt this use will greatly expand when the manufacture of automobiles is resumed.

During the war the demand for this material in the production of flameproof paints has been quite unsatiable. The peacetime demand will probably be much diminished.

4. *Enamels.* For long the use of tin oxide (SnO_2) as an "opacifier" in the enamels was universal. It was found long ago that antimony trioxide served equally well for certain enamels. At least as early as 1930 antimony trioxide was used largely if not exclusively for sanitary ware enamel.



The manufacture of enameled kitchen appliances, as tables, etc., followed by enameled metal refrigerator containers widened this field. The war, in cutting off the supply of tin, left the enamelware field entirely to antimony trioxide, and this demand will continue and probably increase.

Along the same lines, the use of antimony trioxide in the production of ceramics, as encaustic and decorative tiling, etc., is a continually enlarging field.

Conclusion

The prospects for an increasing demand for antimony, especially in the form of oxide, are very good indeed. Improved metallurgy, producing an arsenic-free product, will further widen this field. To what extent the present scanty ore supply of the United States will meet this demand is uncertain. Ores of antimony are duty-free, although there is a duty of two cents per pound on the metal. In the past China has been able to supply antimony ores as low as four cents per pound of metal in New York. What the cost will be in the new China is questionable.

In this connection I quote from the conclusion of an article by Ty Chong in the August 5, 1944, issue of *The Mining Journal* of London:

"Post-war world will find China anxious to import, especially capital goods and industrial raw materials, and antimony is one of China's chief export commodities to pay for her imports."

In connection with the article quoted in part above, it is of interest that the cost of transport from China's fields of production to New York and the chief consuming cities of the United States was in pre-war times materially less than the transport cost of metal or ores from Idaho producing points to the same United States points of consumption.

The other two producing countries from which we draw supplies were for the most part higher-cost producers than China.

Bolivia has seldom supplied this country with ores except in times of high prices, mostly ten cents per pound and over.

Mexican ores in the past have generally been shipped to a United States reduction works. Although these supplies have in pre-war days entered even in periods of low prices, yet Mexican mining costs have risen in recent years and this no doubt will be a factor of more consequence in post-war conditions in the antimony industry.

Another view in the pilot plant at Stibnite

NONMETALLIC MINERALS

Typical Ohio lime plant and quarry with supplementary crushing and screening equipment shown at left

By OLIVER BOWLES
Chief
Nonmetal Economics Division
Bureau of Mines

NONMETALLIC minerals, which are defined as minerals (except fuels) that are employed for uses other than as sources of metals, are attaining increasing importance as materials of construction as well as in the chemical and processing industries. The annual value of sales of such minerals and their primary products in the United States during the past three years has exceeded 900 million dollars, and most of the materials sold were applied to military or essential civilian needs.

Current interest is centered on post-war prospects. Fears of a serious depression in the building materials group of the nonmetallics have been dispelled to some extent by pending or completed legislation providing for extensive highway programs, and by forecasts of an enormous back-log of residential and other types of construction. Producers of cement, aggregates, heavy clay products, gypsum, lime, building stone, slate and asbestos have a fair prospect therefore of substantial markets for several years following the war.

Food will continue to be in heavy demand for some time for domestic needs, for our forces at home and abroad, for our allies, and for feeding the undernourished millions in liberated nations; therefore sales of fertilizer materials probably will be high for several years at least. Mineral products used in the chemical and processing industries will depend for their future prosperity upon the volume of industrial production, which is an unknown quantity at this time; however, if current shortages of goods and services are to be satisfied and if new and improved products are developed, industrial production should stand at a high level in post-war years.

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Nonmetallic Substitutes for Metals

One of the most significant recent advances in the nonmetallics is their substitution for metals in many fields. Glass, the principal constituents of which are such commonplace mineral products as sand and feldspar, is now used with minimum quantities of metal for making plumbing fixtures, pipe, hose nozzles and cooking utensils. Fiber glass may soon invade the metal field extensively. Extremely fine, carefully manufactured glass fibers impregnated with resins are now shaped into forms having strength and rigidity equal or superior to that of an equivalent weight of metal. Such products are still more or less in the laboratory stage but their potentialities are almost endless.

The war-imposed shortage of metals has stimulated an extension of cement applications in fields formerly dominated by metals. Many thousand concrete bath tubs were made in 1943 and 1944 because of the shortage of available materials for the conventional enameled-iron tubs. Reduction in weight and resistance to thermal shock are obtained by using lightweight aggregates in the concrete. Cement sash weights, asbestos-cement water pipes, and reinforced-concrete manhole covers are other products that have recently been substituted for those made entirely of metal. Heavy-aggregate concrete blocks are used in place of pig iron for ship's ballast. It is reported that crude barite from British Columbia, Canada, will be used for permanent ballast in certain ships under construction in West Coast yards. Although the program of concrete ship production has been greatly curtailed, several ships of this type are in successful service.

Research has recently been directed toward the manufacture of leadless ceramic glazes. Even though lead may again be readily available for such use after the war, there is merit in the project from the standpoint of the health hazards of employing lead in pottery manufacture. The most promising substitutes for lead in glazes are lithium and strontium minerals and topaz.

Process Developments

Notable progress has been made in processes of beneficiation or preparation. The Rosiclare Lead and Fluorspar Mining Company began commercial operation of its ferrosilicon heavy-media process of concentration

in March, 1944. After some preliminary difficulties were overcome the method proved to be highly satisfactory. The process is used successfully also in separating garnet from hornblende, feldspar and other rock minerals.

The removal of silica from clay by wet methods is common practice; but, to avoid the heavy cost of drying, a process has been developed for removing the silica in a dry state. This is accomplished with an air separator having an outlet placed at an appropriate point for discharge of the silica.

Air tables have been found advantageous to remove minus 100-mesh particles and to control bulk density of talc used in dry press mixtures.

The new flotation plant of the Consolidated Feldspar Corporation at Kona, N. C., was nearing completion in 1944. It is designed to separate feldspar from a rather fine-grained quartz-feldspar pegmatite, with quartz and mica as byproducts. It will have a maximum capacity of 750 tons a day.

Jet pulverizers that use superheated steam are now employed to obtain extremely fine-grained products having particle sizes ranging from less than 1 micron to 8 or 10 microns.

A new type of equipment for drilling extremely hard rock has been developed in a Baraboo (Wis.), quartzite quarry. A hollow steel rod, 1 in. in diameter is fitted with a water-cooled acetylene torch attachment. The hot flame disintegrates the brittle quartzite in particles about the size of table-salt grains which are carried away by the water. The claim is made that holes can be sunk with this equipment at a rate of 4 or 5 in. a minute, which is many times the rate of the ordinary rock drill. This equipment has possibilities worthy of investigation by operators of hard rock mines and quarries.

A striking development in the preparation of quartz-crystal oscillator plates that are extremely important in radio and telephone equipment is a method of X-ray irradiation whereby the frequencies of the plates may be adjusted downward from their original values. This permits salvage of plates having too high frequencies.

Developments in Building Materials

The sudden drop in demand for cement in 1943 and 1944, after an all-time high output in 1942, led a number of companies to seek ways in which their surplus equipment could be utilized for making other products such as lime and refractories, or for calcining phosphate rock, clay or iron ores. Such activities were generally regarded as temporary expedients to tide over the period until the demands for cement would increase enough to employ the entire equipment, but the movement has focused attention on the possible advantages of making coproducts as standard practice in cement manufacture. Is it not possible that the efficient cement plant of the future may be designed to make several products in addition to cement? Such a development would tend to broaden markets and cushion seasonal fluctuations in demand.

Gazing again into the crystal ball, one can visualize the future use of electrical energy for calcining cement raw materials. Surplus electric power may be available in large quantities in the future, particularly in the Western states, and the price may be low enough to justify experimental work on the use of electrically heated cement kilns.

The high cost of fuel and labor has induced many cement-manufacturing companies to rehabilitate and modernize their older plants. The principal objectives are to increase fuel efficiency and to add labor-saving equipment. Automatic control instruments on kilns, closed-circuit raw grinding, and the use of classifiers, thickeners and filters are recent advances in technology that are reflected in improvement in quality of cement, reduction in costs and increase in output. Air separators are attaining more general use in clinker grinding. The Permanente Cement Corporation has set a new high record of output from a single mill by producing 20,328 barrels in a 24-hour period.

Aggregates consisting of crushed stone, gravel, sand or slag, sales of which approached 190 million tons in 1943, are important constituents combined with cement in concrete mixtures for highways, buildings or public works. An important trend in haulage systems at quarries where crushed stone is produced is toward employment of rugged, diesel-powered trucks capable of handling loads of 15 tons or more. They have no springs, and as they are not used on highways there is no weight limit. Stone-crushing machinery has been modified to some extent by introduction of impact crushers and by employing multistage reduction.

Heavy clay products manufacturers operated at a low level in 1944, but post-war building is counted upon to revive demand. New and improved products are being made, and the emphasis of research is directed toward increasing the economy of brick construction. Tunnel kilns are receiving increasing attention among building-brick producers.

New structural glass products have been developed. "Glastone" blocks used for decorative wainscoting consist of "vitrolite" glass sheets bonded to lightweight concrete in which "waylite" (porous slag) is the aggregate.

Nonmetallic minerals are attaining increased importance in the construction and chemical processing industries. Annual sales value of such minerals and their primary products exceeded over 900,000,000 dollars in the last three years with most of it applied to military and essential civilian needs. Huge backlogs of residential and highway construction offer fair prospect of substantial markets in early postwar years.

Fertilizer Industries Expand—Phosphate Production High

The production of fertilizer materials exceeded all previous records in 1944. According to preliminary estimates, phosphate rock sales exceeded 5½ million tons and potash 820,000 short tons (K_2O content). World demand of phosphate rock for the fiscal year beginning July 1, 1944, is estimated at 10 million tons, therefore unusual activity is forecast for the Florida industry in the immediate future.

The International Minerals and Chemical Corporation will employ one of the largest drag-line excavators in the world at its Peace Valley (Fla.), phosphate rock plant. The machine weighs more than 1,200 tons and has a bucket capacity of 19 cubic

yards. A definite trend is to be noted toward the use of large-scale grinding units at phosphate-producing centers. It has been found more efficient to grind in these large units, and distribute the ground material than for each fertilizer plant or other user to have its own small grinder. Central grinding has also encouraged a wider use of ground rock for direct application to the soil.

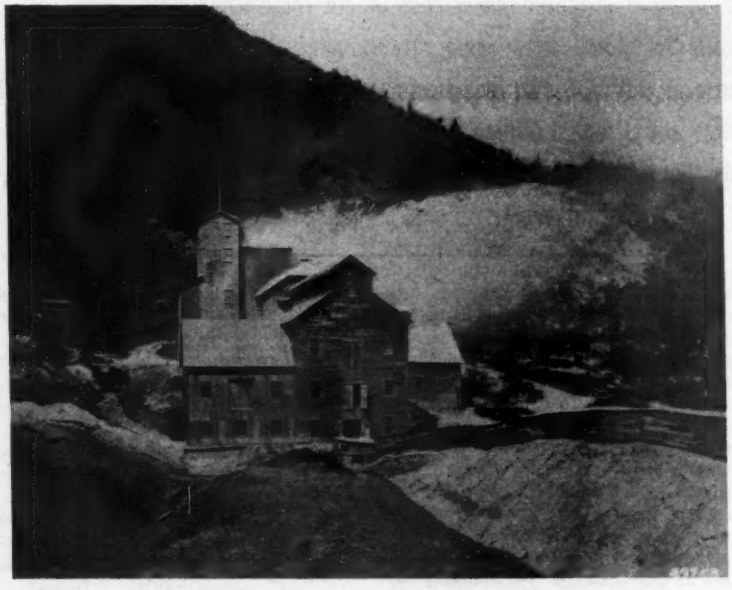
Industrial and Chemical Developments

Industrial diamonds are tremendously important in precision machine work connected with the vast program of war equipment manufacture, and the quantities used have far surpassed all previous records. An important trend in 1944 was the great increase in the employment of diamond grinding wheels. This use, which was minor early in the war, now constitutes the largest single application of industrial diamonds. Their use in rock drilling is also expanding. Diamond tools have long been employed for prospect drilling, but their application to stope drilling in mines is increasing rapidly.

Ceria, introduced in Europe as an abrasive some years ago, is now attaining recognition in Canada for glass polishing. A great advantage over other abrasives is that its hardness can be regulated by varying the temperature of calcination.

Although the steel industry placed heavy demands upon fluorspar producers in 1944, the requirements of other consumers were substantial. Chief among the subsidiary uses were aluminum metallurgy, acid manufacture, production of high-octane gasoline and welding-rod coatings.

Where hard water is treated with lime the sludge-disposal problem may become serious. The lime carbonate sludge is derived not only from the original lime added to the water but additional lime carbonate precipitated from the water itself. The difficulty of disposal has been a strong incentive toward developing methods of reuse. At one large plant in Ohio a premium product for the whiting trade is recovered from the sludge. At Marshalltown, Iowa, the sludge is dried, calcined to lime, and reused in water softening.



Mill of the Vermont asbestos mines near Eden, Vt.

Considerable quantities of stained mica heretofore condemned for the higher-grade uses can now be employed satisfactorily, and this has relieved the situation with respect to strategic mica. The demand for ground mica has been so active that five new mica-recovery units have been established at kaolin-producing plants in North Carolina.

New Mineral Discoveries

As our mineral reserves are constantly being depleted, it is encouraging to note occasional new discoveries of important deposits. Early in 1944 large quantities of slip-fiber asbestos of unusual length were uncovered in a newly developed quarry of Vermont Asbestos Mines near Eden, Vt. As deposits of chrysotile asbestos of spinning quality found heretofore in the United States are small, this discovery is of real importance. The fiber is so long, however, that special equipment must be developed before it can be opened and carded properly. A new deposit of tremolite asbestos suitable for chemical filters is now under development in Alaska.

Exploratory work conducted by the Bureau of Mines, United States Department of the Interior, has established the presence of extensive barite deposits near Magnet Cove, Ark. Several million tons of commercial barite are available.

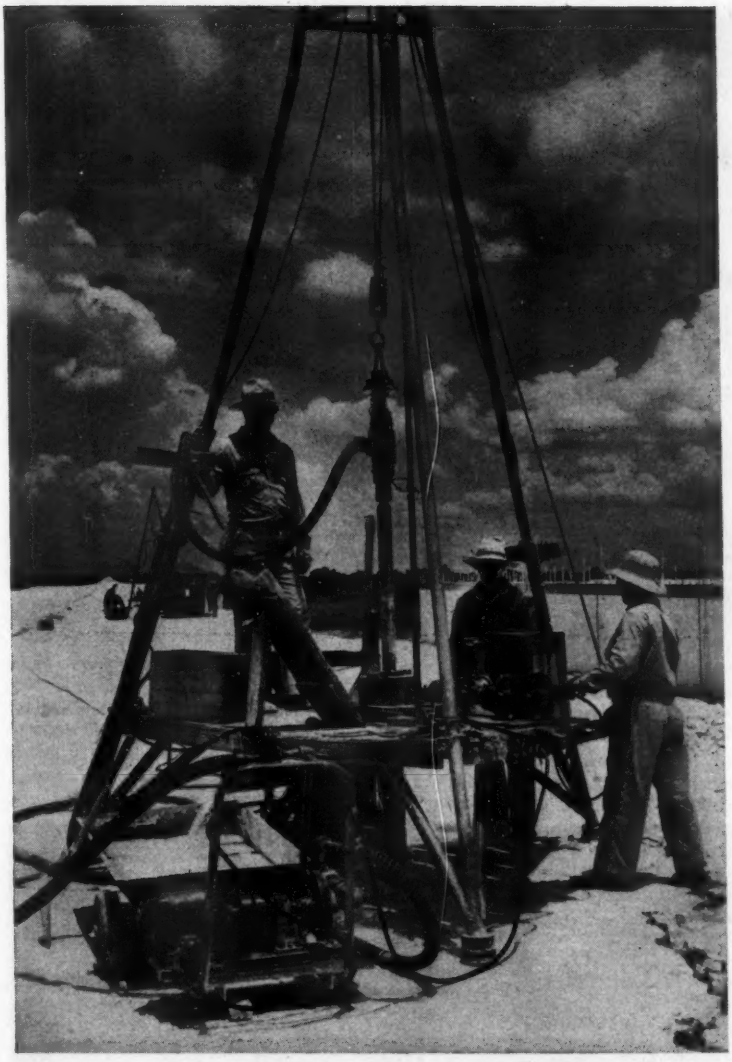
New Products

Glass fiber textiles are now well established as electrical insulators, particularly when impregnated with silicone resins. They are highly heat resistant, and as the power of an electric motor is limited by the ability of its insulation to withstand heat, the use of these new products makes it possible to design smaller motors than were required formerly.

A new glass-asbestos textile was developed in 1944. It consists of 72 percent asbestos of spinning quality, 22 percent glass fiber, and 6 percent cotton yarn. The fabric has only half the weight per square yard of ordinary asbestos cloth but has equal strength. It combines the superior flexibility of the asbestos with the high tensile strength of the glass fiber.

The development of silicones is one of the most striking advances in the nonmetallics during 1944. The replacement of silica by carbon, bridges the gap between organic and inorganic compounds and opens up endless possibilities in the field of plastic bodies. The silicones provide lubricating oils of different viscosity ratings that will function from 70° to 500° F. Silicone rubber retains its elastic properties at temperatures down to 60° below zero and up to 575° above.

The references herein to outstanding events and circumstances are by no means complete but they are indicative of progress in many fields. It is evident that even under the high pressure of war activities that demand more and more production, inventive genius is not stagnant. In the post-war era which we earnestly hope will shortly arrive, many new products and processes will appear, and the nonmetallic mineral industries will assuredly stand on a higher technologic and economic level than at any time in their previous history.



Drilling rig on top of a Texas Gulf Sulphur Co. vat near New Gulf, Texas. Crew is preparing hole to blast sulphur to be broken down for shipment

★ ★ ★ ★ ★ ★

Ample Stocks Are Available to Meet Immediate Needs and Production Facilities Are Installed to Take Care of the Requirements of the Foreseeable Future

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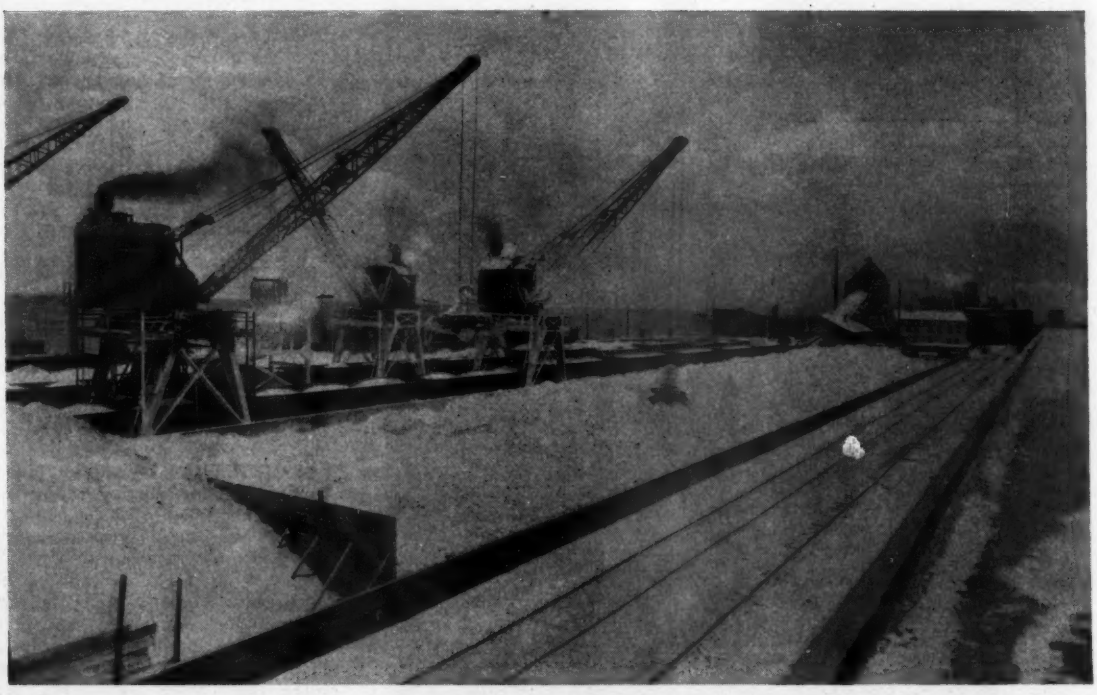
Sulphur

By W. W. DUECKER
Texas Gulf Sulphur Company, Inc.

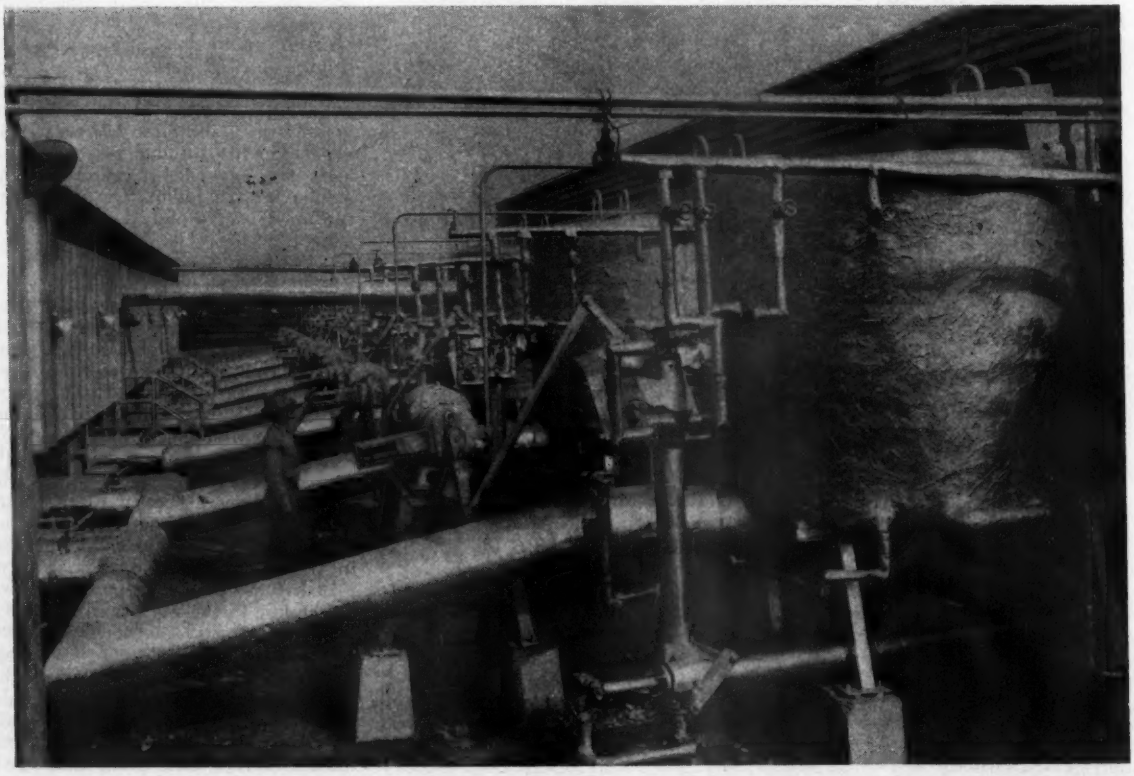
PRODUCTION of sulphur in the United States during 1944 was in the neighborhood of 3,250,000 gross tons. This was 30 percent greater than the previous year and within 6 percent of the all-time high of 3,460,686 gross tons produced in 1942. Mines in Texas produced 80 percent of the total. The balance, except for small tonnages produced in Western states, came from Louisiana. Shipments continued to increase and last year reached a new high of more than 3,500,000 gross tons. This was largely due to greater activity in the sulphuric acid industry. However, the producers of sulphur have inventories of more than 4,200,000 gross tons of sulphur, which quantity is comfortably in excess of the entire consumption in this country during 1944. Also, producers have demonstrated their ability to increase their production of sulphur to more than meet the expanded demands of the sulphuric acid industry and other consumers of sulphur.

Other Sulphur Supplies

There is, of course, no public information regarding the production of by-product sulphur in Axis-controlled European countries such as Norway, Germany and Hungary, while only meager reports are obtained from non-belligerants such as Sweden, Portugal and Spain. Obviously no information is available regarding operations in Japan but descriptions of air raids on the Japanese mainland fail to indicate bombing in the sulphur mining area. Italy, formerly the second largest producer of sulphur in the world and normally producing about 350,000 gross tons annually, is believed to be producing only a few thousand tons a month. In South America production of sulphur is being maintained in Chile and it is said that the sulphur deposits in the Andes are also being developed by Argentina.



Four 3 cu.-yd. clamshells move sulphur from bins to railroad cars or to conveyor belt. Belt takes sulphur over weightometers and to spouts to the waiting vessel—Galveston plant



A battery of metering tanks measure molten sulphur as it flows from the wells of Texas Gulf Sulphur Co., Newgulf, Texas

In Canada, both elemental sulphur and sulphuric acid have been produced for some years from stack gases resulting from the roasting of lead-zinc ores. The sulphuric acid was used to manufacture ammonium sulphate and fertilizer used in Canada. More than a year ago the production of elemental sulphur was discontinued because of the expanded requirements for acid for fertilizer manufacturers. However, this reduction in tonnage of by-product sulphur should be largely offset by developments in Arkansas where a plant to recover sulphur from sour natural gas was placed in operation and is expected to reach capacity in the near future.

Shipments of pyrite to the United States from Europe were sporadic during the past year due to lack of ocean vessels. Most companies accustomed to burn pyrite from the Spanish Peninsula obtained a sufficient quantity to maintain their operations but in some cases supplemented pyrite with elemental sulphur.

The Aldermac mines which formerly shipped substantial quantities of pyrite to the United States, closed down more than a year ago, but this supply was replaced by another Canadian company so that there was little change in the quantity of Canadian pyrite available.

The Transport Situation

During 1944 transportation of sulphur from the mines in Texas and Louisiana was again largely dependent upon railroads. Two barges and an occasional boat were available for movement from the Gulf to the Atlantic Seaboard. However, the quantity of sulphur so transported was quite small. The plants around New York Harbor were again supplied with sulphur which moved via the Mississippi River, the Great Lakes and the New York State Barge Canal. There was some barge movement of sulphur to southeast points and to points along the Mississippi-Ohio River System. The railroads, however, handled a record tonnage of sulphur shipments and maintained a remarkable record for efficiency in deliveries. Before the war 80 percent to 90 percent of sulphur shipments moved by vessel and the remainder by all-rail. Last year these percentages were reversed. As in the previous year, railroad cars were loaded to the maximum capacity consistent with good railroad practice and in this manner the number of cars required was reduced to the lowest possible figure. And, although complete data are not yet available it is known that one sulphur producer equalled the performance of 1943 when the average carload of sulphur shipped was 58.4 tons. This compares with the average of 54.8 tons for the products of all mines as reported by the Association of American Railroads for that year.

Sulphuric Acid

There are two main classes of sulphur consumers: those who use sulphur in the manufacture of sulphuric acid, and those who use sulphur as such or in some form other than sulphuric acid. Of these, the sulphuric acid producers are by far the larger consumers and normally require over three-quarters of the sulphur, from all sources, consumed in the United States.

Last year several new sulphuric acid plants were placed in operation by chemical companies. Most of these use sulphur as a raw material, although one large unit on the Gulf Coast utilizes recovered sludge acid as well as sulphur. There was little change in the capacity of existing acid units operating on smelter gases and no new plants were built during the year.

In spite of the increase in total acid producing capacity, the demand for sulphuric acid in 1944 in certain areas exceeded the supply. Consequently, plans have been made to construct additional sulphuric acid plants in 1945 and increased capacity is contemplated in connection with one smelter. It is believed that this new acid capacity will be available by the end of June and that the gap between supply and demand will then be nearly closed. As a temporary measure to relieve the present shortages, complete allocation of the acid was made effective January 1, 1945.

The Fertilizer Industry

The largest consumer of sulphuric acid is the fertilizer industry. Frank Talbot, of the War Production Board, estimated that this industry in 1944 required 27 percent of all the acid produced outside of ordnance plants. There was no great change in the demand for fertilizers during the year although requirements for increased food production are reflected in the marked increase in production of fertilizer as compared with the year 1939. The industry is making continuous effort to improve its product and the average total plant food content of superphosphate has increased from 19.17 percent in 1939, to 20.24 percent in 1942, with a resultant saving to the farmer.

There has been a gradual realization that sulphur is beneficial to soils. It has been available as a plant food for many years in superphosphate fertilizers, but more recently there has been a steady increase in the application of soil sulphur. This was particularly apparent during the past year in California where the demand for such sulphur exceeded the supply.

The Petroleum Industry

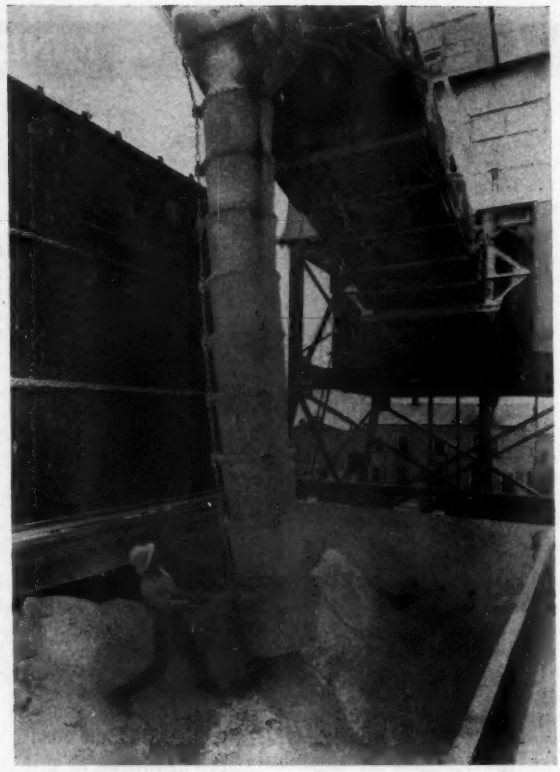
The petroleum industry was a large user of sulphuric acid both in the production of aviation gasolene and in the refining of numerous petroleum fractions. Some believe that we are now entering on "a petroleum era" and that the petroleum industry in the future will not only provide us with gasolene and lubricants but also a host of other materials of which the butadiene used in synthetic rubber manufacture may be considered an example. Consequently there is no immediate prospect of any great reduction in the use of sulphuric acid in the petroleum industry.

Iron and Steel

Large quantities of acid are needed for pickling steel and other metals. If one adds to this the quantity of acid used in making ammonium sulphate, an important ingredient of fertilizers, which is largely produced as a by-product of coke ovens at steel mills, it is estimated that the steel and related industries accounted for 15 percent of the sulphuric acid consumed in 1944. Objections have been raised to the use of acid in pickling steel because of the difficulty in disposing of the spent acid. Likewise attempts have been made to replace ammonium sulphate with ammonium nitrate, the latter being made from synthetic ammonia, but because of certain undesirable physical characteristics in the product, there has to date been no appreciable displacement. Although sulphuric acid will continue to be used by the steel and related industries, it is unlikely that there will be any great increase in the quantity consumed.

Other Consumers of Acid

Sulphuric acid is used extensively in the manufacture of various other acids, alcohols, dyes, chemicals, and paints and pigments, all of which are currently in great demand. Another important consumer is the synthetic fibre and textile industry where the acid is used in the manufacture of rayon as well as cellulose film. The production of rayon, furthermore, requires large quantities of carbon bi-



Barges and boats are loaded by aluminum spout

sulfide, and although production data regarding this chemical are not available, it is noted that the foremost producers of this compound are erecting new plants to expand its output. These industries have grown rapidly during the past few years and will continue to be important consumers of sulphur compounds.

Pulp and Paper

Among the industries which use sulphur in forms other than sulphuric acid, the pulp and paper industry is the largest. In recent years about 15 percent of all of the elemental sulphur consumed in the United States has been used in the making of sulphite pulp for paper. The tonnage of pulp produced during the past year was about the same as the quantity produced during 1943.

The lack of increase in sulphite pulp production can be traced to several factors of which the shortage of manpower was probably the most important. This shortage of men was felt particularly in woods operations where it was impossible to maintain crews at sufficient strength to cut the pulp wood required to operate mills at or near capacity. As a result of the shortage of pulp wood it has been necessary to place restrictions upon the manufacture and distribution of various types of paper, particularly newsprint and to a lesser degree, book, bond, magazine and other types of paper. It has been announced that the quantity of newsprint permitted to be produced in Canada during 1945 will be about the same as the permissible production in 1944. So far Canada has placed no restrictions upon the production of other papers but the production of these is not expected to increase during 1945 unless present conditions change. It therefore is believed that there will be no great change in the consumption of sulphur by this industry in 1945.

The Future

The tremendous effort to supply the demands of war has stimulated abnormally the demand for sulphur, sulphuric acid and other sulphur compounds. Whether this demand can or will be maintained is a matter of speculation. It should be noted, however, that practically all sulphur is used in chemical processes. The chemical process industries are industries of progress. During and after World War I, the American chemical industry, then largely inorganic, made tremendous advances. During World War II, the organic chemical industry is going through a similar period of rapid growth. Plastics, synthetic fibres, synthetic rubbers, and a host of other synthetic chemicals, detergents, wetting agents, coatings, agents for moth-proofing, waterproofing, and crease-resisting fibres, as well as new insecticides and medicinals, are all products of the organic chemical industry. Some say that the future chemical industry may well become the basic industry of our physical civilization. It is recognized that the future demands for sulphur are intimately related to the future of the chemical industry. Ample stocks are available to take care of immediate requirements, and production facilities are installed to handle the needs of the foreseeable future.

Technologists Needed in Federal Service

The need for technologists in the Government service continues, it is announced by the Civil Service Commission. Vacancies exist in Washington, D. C., and throughout the country in such agencies as the War and Navy Departments, the Department of Agriculture, and the Department of the Interior. The salaries range from $2,433 to $6,288 a year, including overtime pay.

Technologists are especially desired who have had experience in testing, development, or production in the following industries: Coal; food; fuels (liquid); paint, varnish, and lacquer; petroleum; synthetic resins and plastics; electrochemical; and process metallurgical. There will be no written test. For the lower grade positions, at least 3 years of experience in technology is required, unless appropriate education is substituted. Additional professional experience is necessary for the higher grades. There are no age limits.

Interested persons may secure copies of the announcement of these positions at the nearest first- or second-class post office, or by writing direct to the U. S. Civil Service Commission, Washington 25, D. C. The announcements contain complete information regarding the requirements and duties of the positions, and instructions for applying.

Federal appointments are made in accordance with War Manpower Commission policies and employment stabilization programs.

POTASH

By F. O. DAVIS

Treasurer
Potash Company of America

Loaded cage ready to take miners underground at New Mexico potash operation

Loaded train in main haulageway, Potash company of America

This Industry Has An Excellent Record in Meeting Requirements in the Face of Labor Shortages and Increasing Agricultural and Chemical Demands

FOR the fifth consecutive year since war broke out in Europe, the American potash industry has shown an increase in total output. Since agricultural and chemical demands have continued on the uprise also, there has been no breathing spell for the producers.

In the spring of 1943, because of the tight situation existing, potash was placed under allocation by the War Production Board in accordance with regulations in Order M-291. This order, controlling the tonnage of the buyer on a historic consumption basis, has been extremely well administered and has resulted in an orderly distribution of the product with a minimum of interference with normal supply and consumption processes. Some interference and occasional hardships are bound to occur in any nation-wide regulatory measures but, on the whole, few complaints have been registered concerning the restrictions which have been in force.

Because of the additional tonnage made available during 1944, and the added tonnage in prospect for 1945, consideration was given in an Industry Advisory Council meeting, held on December 5, 1944, to the removal of all controls. The consensus of the group was that the situation for 1945 was not clearly enough defined to risk the chaos which could result if controls were removed and consumption demands should then greatly exceed the probable supply. It was recommended, however, that all governmental control be removed when it can clearly be shown that the supply is adequate to meet demands. An allocation of tonnage for the spring season will be made early in 1945 and the allocation for the period commencing with May, 1945, ending in May,

1946, will be conditional upon production estimates then available. It is probable that complete allocation will continue through 1945.

Keeping Pace with Requirements

There are few, if any, industries in the United States, classed as essential to the war effort, which have a better record than the potash producers in foreseeing demand and keeping pace with requirements. From a position, prior to the outbreak of war in Europe, where American producers were supplying approximately one-half of a domestic market which totalled less than one-half of the present demand, the domestic industry has consistently increased facilities so that no serious shortage threatened at any time. The expansion of facilities has all been privately financed and plans, in general, were formulated in advance of stringent conditions rather than being forced by a situation of critical shortage. The increase in production has made it possible to maintain the same level of prices; the price of the major product of all companies, 60 percent muriate of potash, has remained the same since May, 1937.

Matters pertaining to acquisition of equipment and of operating and maintenance supplies have been under the jurisdiction of the Chemical Division and the Non-metallics Branch of the Mining Division of the War Production Board. The whole-hearted cooperation and sympathetic understanding of officials in these divisions has been of incalculable benefit in securing prompt and adequate priority assistance and in expediting deliveries. Appreciation of the industry for such assistance cannot be too strongly stressed.

Carlsbad Area Production Is High

The three potash producers in the Carlsbad, New Mexico, area continued during 1944, to supply the major portion of domestic output. Production from that area is now running approximately 85 percent of the total for the nation. Producers at points other than Carlsbad are American Potash and Chemical Corporation, located in California, the pioneer potash producer in the United States, which made a substantial contribution of tonnage, and Bonneville, Ltd., located in Utah. Some small by-product tonnage is produced at other points but the quantity is very small. No major construction projects were completed during 1944 although the United States Potash Company is currently installing facilities, to be available in 1945, which will create substantial additional production. The main reason for added output in the Carlsbad area, during 1944, lies in various process improvements and more complete utilization of the labor force.

Labor Hard to Get

In common with all industry throughout the nation, the major problem faced by the potash producers was that of manpower. In the Carlsbad area the average age of the working force was quite low and the first impact of selection for the armed services was heavy. Replacement employes have necessarily been from a higher-age group and from a class of workers generally not familiar with mining and milling facilities. Despite an extremely high wage scale, workmen were difficult to secure, due in part to the distance from normal labor markets and partly to a housing shortage in Carlsbad. These barriers must still be faced. The usual problems of excessive turn-over and absenteeism were encountered and employe forces were diminishing. To combat this condition, Potash Company of America installed a production bonus plan in December, 1943, which, with a smaller employe force resulted in a substantial increase in production. The success of this venture caused the other operators, United States Potash Company and International Minerals & Chemical Corporation, to petition the War Labor Board for approval of similar plans and the three companies are now all operating under incentive plans. This has, and should continue to, offset to some extent the manpower shortage although other measures, such as employment of women, reduction of sampling and analytical functions, etc., have been resorted to. It also has been necessary to reduce mine development and exploratory programs to the detriment of ore reserve ratios.

In 1943 the four major producers received recognition in the form of Army-Navy "E" awards and the continuance of high production in the face of various difficulties has resulted in the renewal of such awards, each company now having two stars on the flag, indicating semi-annual review and recognition.

In an endeavor to locate added sources of potash material, Potash Company of America, in conjunction with its exploration for magnesium

(*Continued on page* 112)

Surface plant and camp of the Potash Company of America in the Carlsbad, N. Mex., area

QUICKSILVER

By GORDON I. GOULD
H. W. Gould & Co.
San Francisco, Calif.

Tariff Policy, Stockpiling Program and New-Use Possibilities Need Clarification to Bring Confidence to Domestic Producers

QUICKSILVER, so often described as volatile, elusive, or erratic, fulfilled that description in 1944 in more than its physical state. At the beginning of the year, just three months after Government announcements that adequate reserves had been accumulated in stockpile, and after Metals Reserve Company announced the cancellation of quicksilver purchase contracts, prices were on the decline and many marginal mines anticipated shutdown. In the last half of the year, a new use requiring heavy buying for Government account absorbed inventories, pressed remaining production, and placed a demand on stockpile quicksilver. From a near ceiling price of $196 per flask, New York, on October 1, 1943, the January price declined to $151.60, and further to $100.56 in July, 1944. By year end the price had advanced to $145 with every indication that it was headed upwards.

War Years' History

Briefly reviewing the war years' history of quicksilver, the production increased from a pre-war level of about 18,000 flasks annually to the peak year of 1943, when 51,929 flasks were produced. Prices rose from $75 to $90 per flask to an annual average of $196.35 in 1942, dropping slightly to $195.21 in 1943. During this period, production of the metal was given liberal Government assistance by way of priority assistance for materials, supplies, and equipment, manpower help, Government loans for prospecting, development, and equipment, and intensive studies of deposits by the Geological Survey and Bureau of Mines. The high prices were sufficient encouragement to many small operators so that in 1942 there was a total of 196 producers, the largest domestic total the United States has ever known. Likewise, higher prices made it possible for many of the more substantial producers to extend development and locate additional reserves.

In October, 1943, however, producers were informed at a meeting of the Quicksilver Producers Industry Advisory Committee that the various governmental agencies had accumulated a sufficient stockpile for two years' war requirements (based on the heaviest war year demand then known) and that production, which was then exceeding consumption, would have to be reduced to be more nearly in balance with requirements. This was to be accomplished by reduction of assistance previously given to stimulate production and in other ways not then announced. Mention was made of a possible Signal Corps use although the degree of importance which it might attain and the timing were not disclosed. On December 29, 1943, Metals Reserve Company announced the cancellation of all domestic purchase contracts for quicksilver, to become final January 31, 1944. Although prices started to decline after the October meeting, they held fairly well into January, with qualified producers able to sell their production to Metals Reserve Company at $188 (f.o.b. buying depots) until the end of January.

Markets Dull—Many Mines Close

With the cessation of price support by Metals Reserve Company, prices tumbled in a very dull market, causing many domestic mines to shut down. Several foreign producers, operating under purchase contracts with Metals Reserve Company, were able to keep their contracts in effect until later in the year, however, it is believed that at year-end all of those not included in trade agreements have been cancelled. Canadian contracts are known to have been cancelled in the early fall and the buying of Mexican metal ceased in August.

With the decline of buyer interest in the first half of the year, the larger producers accumulated heavy inventories, which in some instances was more than they could carry, thus forcing them to curtail or shut down. Although the curtailment of production was the object of Government action, it was not until June that production was actually less than consumption. In July restrictions on the consumption of quicksilver for non-essential purposes were lifted. In the few months following, beginning in August, increased consumption was largely supplied from inventories accumulated earlier in the year.

New Dry-Cell Battery Enters Picture

The increased requirements beginning in August, though not publicly announced until much later in the year, were for the purpose suggested at the Industry Advisory Committee meeting in October, 1943. The Signal Corps had approved and authorized the manufacture of a new type dry-cell battery having an astounding weight-saving factor together with a resistance to deterioration in tropical climates that makes it far superior for certain requirements to the standard type dry-cell. The prime constituent of this new dry-cell is red mercuric oxide. The purchase of metal for this use alone is almost wholly responsible for the "about-face" of the mid-year price trend and the present price level. Although it is difficult to prophesy to what extent the quicksilver market will be affected in 1945 and post-war years by this new use, it can be stated that the current requirements are very large.

It is quite probable that peak consumption for uses other than in the battery and other new developments has been reached. The better-known pharmaceutical, electrical, instrument, paint, fulminate, and military uses have apparently been quite easily met. The new battery, the development of the organic mercurial compounds, and a number of other new uses may materially affect the future picture.

Conservation Urged By Tariff Commission

In August a report by the U. S. Tariff Commission reported on the status of the quicksilver situation in

the United States, advocating the conservation of domestic resources for security purposes. The erratic nature of the deposits, increased cost of production, and decreasing grade of domestic ores were the inferred reasons for looking to foreign production for the bulk of our normal supply. It should be pointed out, however, that it is only through the operation of domestic mines that reserves are discovered and developed; that because of the war stimulation, reserves known as of the middle of 1944 were probably larger than had been known for many years previous; and that the closing of many mines then open, has through caving in of many of them, increased the cost of and time for production from these reserves. It is certainly to be hoped for that the Commission will meet the problem fairly in recognizing the need to keep domestic production of quicksilver an active industry.

The passage of the stockpile bill in early November, including quicksilver is naturally of great interest to all producers and plays an important part in our military security. The results of the study being given to all materials being considered by the Army and Navy Munitions Board and their recommendations as to quantities to be stockpiled may well be the answer to what effect such stockpile may have on domestic market conditions.

Although nominally in stockpile, quicksilver was released, beginning December 1, 1944, on authorization by the War Production Board. Being released at a figure slightly higher than the market price it has tended to steady the price and prevent importation although it is generally felt that unless American producers are given an opportunity to replace metal drawn from stockpile, either the stockpile will be depleted to a degree not consistent with security, or foreign metal will invade the American market thus causing still further mine shut downs.

Due very largely to the decline in price of metal during the early part of the year, the more difficult labor conditions, and in some instances to depletion of ore reserves, the ranking of individual producers changed rather materially. The New Idria Mine in California continued to rank first by a large margin. The Hermes Mine in Idaho, second in 1943, was forced to cease operations in April due to lack of manpower, and was replaced by the Reed Mine in California. The Abbott Mine in California made a notable gain in 1944 to assume third place, followed by the Mt. Jackson Mine, another California producer which was well up on the list in 1943. The Cordero, Bonanza, Horse Heaven, New Almaden and others suffered more or less curtailment. Important mines shut down in 1944 include the Sulphur Bank, Klau, Mt. Diablo, Oat Hill, Pershing, Falcon, Harold's Club, and a host of smaller producers.

Forecast

Although the outlook at the end of 1944 was very encouraging price-wise, with some authorities believing that the price would go back to the ceiling, there is a general skepticism based on several factors. One of the most important is the feeling that Italian production, largely from the now liberated portion of Italy, and Spanish production may soon be dumped on the American market. A second and nearly as important a consideration is for a statement of policy as to the American stockpile. Thirdly, there is a feeling that the large current demand may be of a temporary nature not justifying the expenditures required for reopening and rehabilitating mines now caved and under still difficult labor shortages.

A clear statement of tariff policy or other regulatory measures as to foreign metal and a straightforward statement as to our domestic stockpile plan would, together with a time analysis on the permanency of new use requirements, be an invaluable guide to the quicksilver producer. If these are not forthcoming shortly it may well be expected that production in 1945 will decrease materially below 1944.

Potash

(*Continued from page* 110)

and oil, continued its work in Grand County, Utah, completing a program of sinking four test holes spaced around the hole drilled by Utah Magnesium Corporation. This hole had indicated the presence of commercial deposits but the added core testing failed to substantiate this finding and operations were abandoned, at least temporarily, early in 1944.

Industry Now Enjoys Percentage Depletion

Somewhat belatedly, the potash industry received consideration by the Seventy-eighth Congress by virtue of being included in the percentage depletion provisions of the Internal Revenue Act. When percentage depletion was first promulgated there were no potash mining operations in the United States, the only potash producer secured its material from a brine deposit at Searles Lake, Calif. As a consequence, no consideration was given to percentage depletion provisions for potash. This inequitable exclusion is now removed and all producers, including the brine operations, are now treated uniformly with other mining ventures.

Agricultural Ties Important

The future of potash development is inextricably tied into the agricultural needs of the nation. In normal times, less than 10 percent of consumption is attributable to the chemical industry; the balance is consumed in agriculture, either as a component in mixed fertilizers or by direct application to the soil. Use of chemical fertilizers is of comparatively recent origin in the United States and the need for such soil treatment has not yet been fully recognized. Certain parts of the country, particularly those which have been consistent "one crop" producers, have made use of such fertilizers for several decades. However, as soil depletion becomes more apparent in all areas, and as all parts of the country begin to feel the effects of intensive cultivation, the need for restoration of potash in the soil becomes obvious. The constant campaign of study and testing carried on by experimental stations and other agronomical agencies has shown the need for replenishment of the natural plant foods. This replacement requirement is constant and as further soil depletion occurs the need for potash increases. It would appear that a steadily mounting demand is in prospect for the product, even when the war impetus is removed.

Postwar Tendencies

What portion of the domestic market can or will be retained by the domestic producers after hostilities cease and normal commerce is resumed is a matter of conjecture. Prior to World War I practically all potash consumed in the United States came from Germany. As a result of the peace treaty, France acquired certain potash producing areas and became a factor in the world market. Exploration disclosed deposits of potash in Russia, Poland and Spain and production was started from brine deposits in the Palestine. These points are all potential suppliers to the United States' market. However, the advent of American production, after the Carlsbad deposits were discovered, resulted in a marked reduction in price to the American consumer and the domestic producers had secured a firm position in the field before World War II commenced. It is hoped and expected that this vital industry, necessary to the well-being of the nation, as a substantial employer of men and the producer of an essential commodity, will firmly hold its position in the industrial sphere.

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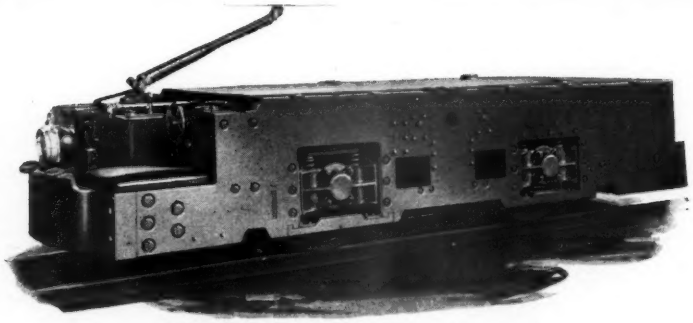

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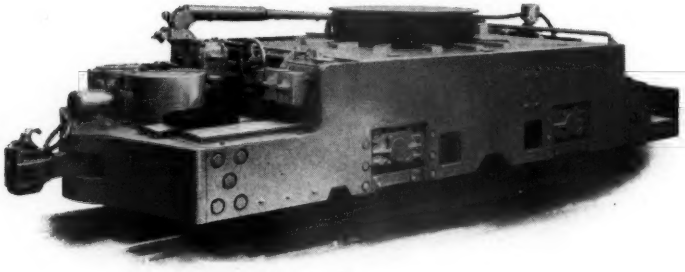

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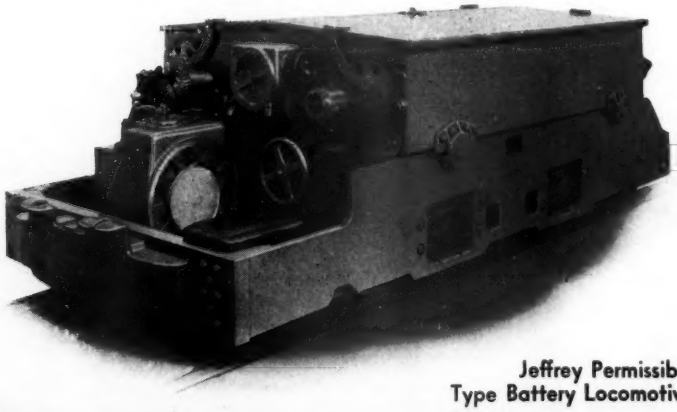

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MISCELLANEOUS MINERALS

By the MISCELLANEOUS MINERALS DIVISION
War Production Board

JAMES L. MACGREGOR
Director

Current Supply, Requirements and Uses of Various Minerals Are Reviewed With Comments on the Impact of the War Effort on Each. The Status of Some Minerals Changed Surprisingly During the Year

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CORUNDUM—FELDSPAR—TALC

By J. E. EAGLE
Chief, Nonmetals Section

CORUNDUM

IMPORTS of corundum during 1944 were slightly higher than in the previous year. Most of this increase, however, was due to new deliveries of Canadian ore concentrates and did not reflect any particular increase from African sources.

The requirements of the optical industry decreased slightly during the year and were readily met, since this industry could use both crystal and boulder ore as well as concentrates. On the other hand, the grinding wheel industry requires coarse corundum grain only procurable from high-quality crystal ore and the percentage of imports in the form of this ore declined during 1944. As a result, although this material is under allocation, the wheel industry operated on a hand-to-mouth basis throughout the year. Various exploratory and development programs, both domestic and foreign, were carried on through the combined efforts of the War Production Board, the Foreign Economic Administration, and the Bureau of Mines. While the foreign programs have not as yet resulted in any noticeable increase of imports from the South African area, we are now receiving concentrates from Canada in small quantities and shipments received for test purposes from Brazil indicate that there may be deposits in that country worthy of exploration.

Two domestic programs conducted by the Bureau of Mines are nearing completion, one in North Carolina and one in Montana. While prospects of any volume of production in North Carolina do not now seem promising, the Montana deposits show indications of providing reasonable tonnages of high-grade crystal ore and the construction of a mill is now awaiting the development of sufficient ore to warrant its erection.

During 1944, attempts were made to relieve the corundum supply situation by utilizing the mineral garnet in various applications. Although garnet eventually proved to be unsuitable for manufacture of grinding wheels and somewhat questionable in the grinding operations of the optical industry, it did prove moderately satisfactory in superfine sizes and it afforded some relief in that field. The various attempts to improve the abrasive efficiency of garnet by controlled roasting failed to yield satisfactory results.

For the two principal applications currently requiring practically the entire corundum supply, namely, the manufacture of abrasive grinding wheels and the grinding of ophthalmic lenses and precision optics, no substitute material has been found which is entirely satisfactory from the standpoint of abrasive efficiency for operating practicability. Since both of these applications have a very high degree of essentiality in the war effort, the need of adequate supplies of good-quality corundum ore is obvious.

FELDSPAR

DESPITE a serious labor shortage throughout the entire industry, the production of ground feldspar for 1944 was slightly above the 1943 figure of approximately 350,000 tons. A labor shortage was occasioned in part by the diversion of some feldspar miners to the production of strategic mica and to the induction of other feldspar workers in the Armed Services.

With the exception of a small percentage used in the manufacture of soap and abrasive cleaners, the entire production of feldspar was taken by

the ceramic industry, more than half of which went into the production of glass. The increased consumption by the glass industry resulted from the demand for glass containers, particularly for food products. Other container requirements existed but could not be satisfied due to a lack of sufficient crude feldspar ore. During 1944, construction of a plan was begun at Kona, N. C., to produce feldspar by froth flotation from pegmatite ore low in feldspar. Operation of this plant should start in early spring. It is anticipated that the process will make possible the production of high-grade feldspar of uniform quality from this low-grade ore and that the silica and mica produced as by-products will assist in making operations profitable. If successful, the utilization of tremendous ore reserves would assure an ample future supply of feldspar when the present high-grade deposits become somewhat depleted.

TALC

THE production of talc in 1944 dropped but slightly from the 1943 figure, which approximated 310,000 tons. The slight decrease was due principally to lower production of New York State fibrous talc. During the early part of the year the general supply position was satisfactory but became progressively less favorable during the second half so that by year's end supplies were tight in all areas except California.

The production of steatite talc, mainly in California, continued at the relatively high level maintained in 1943 and exceeded requirements for the manufacture of steatite porcelain by such an amount that this talc could be freely used for less important end uses.

The California production of non-steatite talc, including fibrous grades, increased steadily during 1944, due principally to higher requirements of paint manufacturers and some increase in the production of insecticides. Consumption by the ceramic industries seems to have remained at about the 1943 level.

Production of New York State fibrous talc was adversely affected by a continuing labor shortage which prevented proper mine development to block out the type of ore most needed. The requirements for New York State talc in the manufacture of paint for essential purposes increased steadily concurrent with a lowering of production and by the end of the year this resulted in a tight supply situation.

The production of so-called common grades of talc, manufactured from massive or foliated talc and certain types of soapstone, centers largely in the Vermont and Georgia-Carolina areas. The supply of this talc has previously been more than ample to meet all essential requirements. During the spring and summer of 1944, however, a shortage in the supply of pyrophyllite necessitated the substitution of talc in many applications where it had not formerly been used, particularly in the manufacture of agricultural insecticides. Requirements of the paper and rubber industries likewise increased with the result that by the end of 1944 the supply position of these grades was relatively tight.

The requirements for block steatite talc for the manufacture of radio insulators declined somewhat during 1944, due in part to decreased program of tube manufacture and in part to the increasing use of dry-pressed insulators. The remaining requirements apparently can be met by current imports of Indian block talc and a somewhat increased production from Montana mines.

The production of sawn talc crayons for metal marking continued at about the same level experienced by this industry during 1943, due partly to labor shortage and partly to lack of talc ore of suitable quality for cutting into crayons. This shortage in supply has been relieved by the manufacture of crayons from a mixture of ground talc with suitable binders.

MERCURY—PLATINUM GROUP—SILVER

By H. E. STAUSS
Chief
Precious Metals and Mercury Section

MERCURY

THE year began with mercury in an extremely easy position. Supply and production were at high levels and industry was producing at a monthly rate of approximately 4,500 flasks. Demands on domestic supply for export and for certain domestic requirements had declined. Metals Reserve Company discontinued purchasing domestic production in January and in mid-summer contracts with Mexico were terminated. In February mercury order M-78 was revoked and all restrictions on its use were removed. Consumption continued low, and production declined, but exceeded requirements until May.

Coincident with declining demand, the price of mercury fell in successive months from $190 per flask in January to a low of $98 in July. New requirements began to appear following mid-year and prices began to firm, reaching $140-$145 at the end of the year. With the decline in price, domestic production was curtailed and by November demand exceeded available open market supply.

As a result, the War Production Board and Metals Reserve Company reached an agreement to release mercury from Government stocks at a price based on current market quotations, but slightly above it, for uses essential to the war effort and in amounts required to make up shortages. Releases have been made from reserve stocks since early in December and have filled the gap between current production and requirements, the former having dropped from some 4,500 flasks in January to 2,300 flasks in November.

PLATINUM GROUP

NINETEEN hundred forty-four opened as one of general uncertainty for the platinum group metals, but proved to be one of general easing as the year wore on. At no time was the situation of any of the six metals critical in spite of ominous threats.

As the year began, the requirements for platinum were obscure because of demands for spark plugs, electronic tubes, and glass fibre bushings, but by mid-summer the estimated needs had been scaled down and the supply-requirements position was in balance. New intake during the year, supplied from Canada, Russia, Colombia, and Alaska, was somewhat below the previous year's level. Recovery of secondary metal was not as great as had been anticipated. The largest consumption occurred in the electrical field for uses such as spark plugs, contacts, and electronic tubes; chemical uses were second and included catalysts, spinnerettes, and miscellaneous industrial requirements. Dental and medical consumption increased somewhat over previous years.

During the years 1943 and 1944, important changes in supply developed. Available Canadian production was reduced largely as a result of changes in nickel mining. Fortunately, the loss from this source was made up in part by the other producers. Refining problems which had been troublesome in the early years were largely resolved by industry.

At no time in 1944 was it possible to consider permitting the use of platinum in jewelry. In July, WPB informed the precious metal manufacturing industry that platinum would not be available in the near future.

Iridium-ruthenium combined remained fairly stable during the year. The requirements for the two metals for contact points declined. The use of ruthenium in jewelry increased some 25 percent over the previous year in part as the result of the liberalization of the precious metals jewelry order L-45 in February and its complete revocation in August and in part because of the greater acceptance of palladium in jewelry. The supply-requirements picture of iridium became stabilized and made possible an amendment to M-49 in July, removing it from allocation, although the order was continued as a tight conservation order. No attempt was made by WPB to control the use of ruthenium.

In the early part of 1944, users of platinum-rhodium gauze catalysts switched to the alloy containing 10 percent rhodium to replace an emergency alloy carrying 5 percent. Consumption of this metal declined, but continued fairly high, mainly in catalysts, spinnerettes and contact points. The general supply position was comfortable, but the restriction on the use of rhodium in jewelry was continued.

The market for osmium was easy throughout the year. Osmium continues as a hardening agent for several platinum group alloys, but no new uses have developed. Its use for electrical contact points dropped substantially. The large demand for osmium prior to April 16, 1943, for electrical uses led to a limitation on its use subsequent to that date except for implements of war. No changes occurred during the year in the control of osmium.

The uses of palladium for jewelry, electrical contact points, catalysts, and dental alloys remain unchanged. There is no indication that requirements in 1945 will differ from those in 1944. No controls are imposed on palladium and the restriction on its use in jewelry contained in order L-45 was removed by the revocation of that order.

SILVER

THE over-all use of silver from domestic supplies and new intake during the year totaled some 388,000,000 fine oz., most of which was for lend-lease account and for domestic coinage. Some 120,000,000 oz. were required for domestic industrial use.

New silver coming on the industrial market totaled some 89,000,000 oz.—54,000,000 from imports and some 35,000,000 from domestic production. Approximately 40,000,000 oz. of Treasury "free" silver were sold for essential industrial purposes upon War Production Board authorization. The general pattern of industrial consumption was similar to that for the year 1943, with the exception that requirements for brazing alloys and solders increased substantially in comparison with the previous year.

Silver had its share of problems during the year, but by reason of existence of large reserves of Treasury "free" silver stocks, at no time was there any question of ability to meet essential requirements. Imports were somewhat less in volume than for the previous year, although not substantially so.

The supply and demand of newly-mined domestic silver were in close balance until the latter months of the year, when domestic production declined. Because of the War Production Board's policy of not permitting withdrawals of Treasury "free" silver for non-essential purposes, supplies were inadequate in the last quarter of the year to meet the quotas of those entitled to use it under silver order M-199.

The Green Act, Public Law 137, which by statute expired December 31, 1944, was extended for one year as Public Law 519. Members of Congress at the time of this extension emphasized by statements read into the record that the War Production Board should not feel bound to restrict releases of Treasury "free" silver to uses directly connected with the war effort, and as a result the War Production Board began exploring the possibility of removing restrictions on the use of Treasury silver by industry within the pattern of over-all use previously established by the Board.

QUARTZ CRYSTALS

By R. B. McCORMICK
Chief
Quartz Crystal—Diamond Die Section

THE quartz crystal industry had its biggest year in 1944. Over 100 quartz oscillator plate manufacturing concerns handled $150,000,000 worth of orders, 99.5 percent of which were on direct Army and Navy contracts. Between $10,000,000 and $15,000,000 worth of quartz crystal raw material was purchased and imported from Brazil to meet manufacturing requirements.

During the year a great many technical advances were made which aided the supply picture considerably. The industry has learned to use progressively lower and lower quality raw material while at the same time techniques have been developed permitting the manufacture of plates out of individual crystals as small as 100 grams. Both of these advances have tended to help stretch the existing raw material supply.

The development of techniques for etching oscillator plates to final frequency was perfected during the year so that now nearly all Army-Navy specifications require that the finishing operations be carried out in this manner. This new technique has virtually eliminated the phenomenon of "aging" of plates.

The search for domestic deposits of quartz crystals virtually ceased during the year after intensive work by governmental agencies and private concerns indicated that existing deposits in this country are so sparse as to be economically unsatisfactory. Several shipments of good radio quality material from other countries, notably Colombia, Guatemala, Mexico, Chile, Madagascar, and the USSR indicate that there are other sources in the world which may, in time, prove to be equal to or better than Brazil.

FLUORSPAR AND MICA

By F. F. WATTS
Deputy Director

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FLUORSPAR

WARTIME consumption of fluorspar continued at a high level. On the basis of data available, domestic production for 1944 was approximately 450,000 tons and consumption approached this production. In addition, imports of approximately 90,000 tons helped to create a comparatively easy over-all supply position.

The Illinois-Kentucky field continued to furnish a high percentage of requirements. Production at Northgate, Colo., and Gila, N. Mex., furnished an increased supply, but the future of these areas is uncertain.

The United States Geological Survey and the Bureau of Mines continued to lend assistance in the field for prospecting and developing new reserves.

The consumption of metallurgical-grade fluorspar during 1944 showed a decrease of about 3 percent, even though a new peak in steel production was reached. It is not anticipated that consumption will increase during 1945.

The demand for acid-grade fluorspar increased during 1944 despite decreased use in the production of aluminum, and new production was a small fraction below requirements. The stepped-up production of hydrofluoric acid for use in the manufacture of high-octane gasoline, insecticides, refrigerants and secret military programs, combined with a contemplated step-up in the aluminum program, indicates a further increase in consumption of acid-grade during 1945.

A shortage of milling capacity and of concerns experienced in milling technique, as well as an unfavorable spread between the ceiling prices for metallurgical and acid-grade make it difficult to assure that all requirements will be met. Ample quantities of metallurgical grade are at hand and are being made available to mills capable of beneficiating it to acid-grade. Plans are in progress for making at least one idle mill available to a capable operating company. Some modification of this mill will be necessary, however, before production can be started. During the latter part of 1944, a new flotation mill in Newfoundland began production and has supplied satisfactory filter cake. Hazardous transportation during the winter and lack of storage facilities in Newfoundland may deny us the benefit of this production until spring. It is expected that about 1,500 tons a month will become available from this source. Drying facilities have been provided at an existing plant.

The consumption of ceramic-grade fluorspar continued in moderate volume and production exceeded requirements during 1944. It was not necessary to divert stocks of this grade to the manufacture of basic electric furnace steel during the year. It is expected that consumption will continue at about the 1944 level during 1945, and that production will amply fill requirements for the glass and enamel industries.

MICA

CONSUMPTION of muscovite block and film mica during 1943 reached an all-time peak. At the beginning of 1944 it appeared that requirements would continue at a high level and plans for an increased supply were made. However, an early downward trend soon made it apparent that the reverse was true, and this trend continued throughout the year. Consumption of the better qualities in December was down to

about one-half the amount consumed in January.

Practically all of the better qualities are used as insulation or as a dielectric in the manufacture of components for aircraft, radio, and radar. Production of these end products was maintained at high levels, but there was a change in the pattern of capacitor components from large to smaller sizes which require much less mica by weight per thousand of units produced. Satisfactory substitutes were used for many of the large capacitors. As the production schedules for the mica capacitor became less urgent, manufacturers found it desirable for economic reasons to work up accumulations of residue mica films outside the thickness tolerances of their normal production runs. It is believed that these matters and perhaps an earlier excessive lead factor in some of the production scheduling for capacitors are responsible for the continued downward trend in the consumption of mica.

Stocks of the larger sizes of best quality mica for the aircraft magneto program continued in short supply, but requirements were met by a closer selection of the better qualities, and sorting lower-quality stocks.

India and Brazil continued to furnish more than over three-fourths of the new supply of muscovite mica. Total receipts were less than for 1943, but were more than ample for the reduced consumption. Stocks increased by about one-half during the year and the supply position is now considered very satisfactory. There is now no forseeable likelihood of shortages developing.

War Production Board conservation order M-101 was amended September 16, 1944, to permit unrestricted use of the small-size muscovite mica, since stocks were ample to meet all needs. This order was further amended on December 12, 1944, to permit unrestricted use of green muscovite mica, in an effort to encourage greater use of this material, and to remove all restrictions on sale of block and film. Sufficient stocks of ruby mica to meet the more critical needs, made this last amendment possible. There is now sufficient mica available for all small capacitors, and capacitors of A and B characteristics.

The supply position no longer warranted purchase of the small-size mica at high cost, and the War Production Board recommended that the public purchase of small-size domestic mica, and green mica from all sources, be discontinued on December 31, 1944.

A National Research Council project for the development of mica testing equipment conducted by the Bell Telephone laboratories under WPB sponsorship, was completed by year end. Results indicate that, neglecting economic factors, a much greater utilization is possible of lower qualities of mica in stocks available. The improved stock position makes unnecessary a full utilization of the results of this research project but the information obtained will be of great value if mica should again be in short supply.

There has been further research by private industry in the development of substitute or alternate materials, notably paper, glass and ceramics. Paper continues to be the chief substitute, although substantial progress has been made in gaining acceptance of glass and ceramic insulation in capacitors. Ceramic insulation for spark plugs has replaced mica to a very large extent.

Madagascar continues to furnish most of phlogopite block mica for use in the manufacture of spark plugs and for other high-heat applications. The program for the manufacture of spark plugs using mica for insulation has been curtailed, and consumption has decreased. Supply exceeded requirements, and stocks have accumulated. It has been recommended that public procurement be discontinued as soon as existing commitments permit.

India is the sole source of muscovite splittings and except for the larger sizes of bookpacked, supplies have been ample. During the year it became necessary to issue War Production Board conservation order M-101-a to limit the use of the larger sizes of bookpacked splittings to the manufacture of insulated tape and other close-tolerance applications where a maximum of insulation is required with a minimum of thickness. Consumption has decreased to reasonable levels and it is expected that it will soon be possible to revoke the conservation order. Total consumption of muscovite splittings during 1944 exceeded new supply but late arrivals (not reported in year-end figures) should make up the deficit. The total supply position is very satisfactory and 1945 requirements should easily be met.

Madagascar was the principal source of phlogopite mica splittings, with small quantities being obtained from Canada and Mexico. A considerable quantity of machine-split material was produced in the United States from raw materials imported from Canada. Consumption was less than new supply and the stock position was very satisfactory at the end of the year. Requirements for 1945 should easily be met.

Miners at portal of the Cloudland mica mine, Mitchell County, N. C.

IRON AND STEEL SCRAP

Iron and Steel Scrap Industry Continues Laudable Performance

By HAROLD E. CARMONY
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DURING the year 1944 the scrap industry continued its zealous efforts to supply iron and steel scrap to foundries and steel mills, and was able to furnish material at a rate only slightly less than that in 1943, despite a large loss in scrap salvage and withdrawal of many consumers from the scrap market for a time. Other factors, such as limited supplies of gasoline and tires and manpower shortages tended to hinder their efforts; in consequence, many dealers operating small yards were compelled to engage in other more remunerative activities.

The withdrawal of consumers from the scrap market caused reductions in prices, produced the erroneous impression that supplies were adequate, and in turn influenced the Office of Price Administration to rescind the order that automatically certified scrap dealers to receive additional gasoline as members of a critical industry. Despite the sustained labors of the scrap industry, stocks of iron and steel scrap held by consumers, producers, and suppliers declined nearly 1,000,000 tons in the interval from January 1 to December 31, 1944.

Ingot Production Rate is High

The high rate of ingot output evident during the preceding years of war production, was maintained throughout 1944 and might have been nearer capacity had it not been for shortages of manpower. However, the rate was sustained above 95 percent of capacity in all but a few weeks, resulting in the establishment of a new production record of approximately 79,800,000 gross tons of steel ingots and castings. Although data for November and December are not yet available, it is estimated that consumers used over 23,300,000 tons of purchased scrap during 1944, only slightly less than the 23,762,000 tons consumed in 1943. Thus it is evident that this large tonnage of purchased scrap was a major contributing factor in the new steel production record.

Combined with the purchased scrap nearly 31,650,000 tons of home scrap were used, making a total of 54,950,000 tons of iron and steel scrap consumed during 1944 in the production of cast iron, malleable iron, steel ingots and castings, and ferro-alloys and for miscellaneous purposes. The amount of total scrap used in 1944 was second only to that consumed in the record year 1943, when 55,242,000 tons were used. In addition to the 54,950,000 tons of scrap consumed, 54,775,000 tons of pig iron were used—an increase of almost 2 percent over the 53,853,000-ton figure for 1943. In spite of the slight reduction in the consumption of purchased scrap, the tonnage of ferrous materials (scrap and pig iron) used for all purposes in 1944 was the largest in the history of the iron- and steel-making industry, and totaled almost 110,000,000 gross tons.

Scrap from Manufacturers and Railroads Increases

Continuation of the high rate of purchased scrap consumption was attributable more to the increased quantity of scrap produced by manufacturing concerns and railroads than to the amount of scrap salvaged by dealers and automobile wreckers. Scrap production by manufacturers and railroads reached a peak in the spring of 1944, during March, April, and May, and totaled over 11,800,000 tons for the year, or approximately 8 percent greater than the 10,900,000 tons produced in 1943. However, scrap salvage, as reported by dealers and automobile wreckers, decreased about 19 percent from the 11,500,000 tons salvaged in 1943 to 9,350,000 tons in 1944. As would be expected the salvage of scrap reached a high point in May and June and then declined throughout the remainder of the year. Despite the large loss in scrap salvage, dealers maintained shipments to consuming mills at a rate only 7 percent less than that in 1943, although they depended greatly on industrial scrap to do this.

The average monthly shipments in 1944 to consumers, as reported by dealers, approximated 1,375,000 tons as compared with 1,475,000 tons per month during 1943. However, dealers could not be held accountable for the entire decrease in shipments, since some consuming mills did not purchase scrap to any great extent during the period commencing the latter part of August and extending into November. This is more evident upon comparing the percentage of decrease in shipments to consumers for the interval between January to August, inclusive, with that during September and October. During the first eight months of 1944 shipments by dealers to consumers declined only 6 percent from those in the same period of 1943, whereas shipments in September and October decreased 13 percent from those in the same months of the preceding year. In addition, from January 1 to August 31 dealers reduced their inventories over 36,000 tons, but from September 1 to October 31 stocks held by dealers increased almost 160,000 tons. The reported shipments to consumers by producers and suppliers in 1944 amounted to more than 21,000,000 tons, or 10 percent less than the 23,300,000 tons shipped in 1943. The quantity of scrap shipped in 1944 represented over 90 percent of the total purchased scrap consumed during the year.

Mill Stockpiles Supply Deficit

Following the decrease in shipments of scrap to consumers, it was necessary for the mills to depend on their stockpiles of purchased scrap to supply the deficit so that the high operating rate could be maintained. This resulted in a decrease in stocks of purchased scrap at consumers plants, from January 1 to October 31, 1944, of approximately 680,000 tons, with a further decline in November. The extent of the latest decrease cannot be directly determined at present, but estimates indicate that it may approach 200,000 tons. To assist in maintaining the high production rate, the consuming industry increased the quantity of home scrap in its furnace charges to partly offset the reduction in purchased scrap.

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Price Fluctuations

The price for scrap was determined by Maximum Price Regulation Number 4 during the first eight months of the year, with No. 1 Heavy Melting Steel Scrap quoted at $20 per gross ton (Pittsburgh); however, when consumers refrained from buying, the market weakened during the first week in September and continued to drop until the beginning of November, when the quoted price was $15.75 per ton (Pittsburgh). Thereafter the market strengthened and rose steadily until the maximum price of $20 per ton was again attained early in December. Some of the other grades of scrap showed similar or greater price declines, for example, machine-shop turnings dropped to approximately one-half the former quotations at various cities in the United States.

The weakened market was mainly attributable to the reluctance of consuming mills to buy scrap at the maximum price level, possibly due to over-optimism regarding the early cessation of hostilities in Europe and not to an abundant supply, since purchased scrap stocks held by consumers and suppliers on August 31, 1944, totaled only 4,484,000 tons. These inventories were the lowest since September 30, 1942, just before the intensified scrap drive. With the declines reported in September and October, stocks of purchased scrap were reduced to 4,372,000 tons on October 31, 1944.

At the beginning of the year alloy scrap, especially machine-shop turnings, was very abundant, due to a greater use of alloy steels. Therefore, January 13, 1944, Supplementary Order M-24-c, which controlled the segregation and use of alloy scrap, was amended by the War Production Board to permit consuming mills to melt certain grades of low-alloy steel scrap in the production of carbon steel or iron. This amendment was issued because the supply situation of these types of alloy scrap warranted it, although segregation of other grades continued to be necessary. Following this, Direction 4 to Supplementary Order M-21-a was revised on January 21, ordering producers of alloy iron or alloy steel to use certain specified percentages of alloy scrap solids and turnings in their production each month to relieve a possible oversupply of alloy scrap, especially machine-shop turnings.

Direction 4 to this supplementary order was again amended on September 13, increasing the percentages of alloy scrap solids and turnings that were to be used in melting alloy iron or alloy steel. Then on October 27, Supplementary Order M-24-c and Direction 4 to Supplementary Order M-21-a were both rescinded, since supplies of virgin alloys were larger. The revocation of these orders had no apparent effect on alloy scrap segregation, as producers, suppliers, and consumers were well educated regarding the necessity of and the benefits derived from the conservation of alloying elements.

1945 Outlook Not Too Optimistic

At the end of 1944, the outlook for the year 1945 is not too optimistic, as far as the scrap situation is concerned, especially since reverses were incurred in the European phase of the war. In view of these reverses the demand for scrap should remain at a high level, and with the advent of winter weather that hinders the collection and preparation of scrap, there is a grave possibility that dealer inventories will decline for the next few months, as will stocks held by consuming mills. Partial reconversion to non-military programs, which had been advocated during the late summer months and later tentatively approved, was halted and frozen at fourth quarter levels on December 7, with a reduction from those levels anticipated. This was necessitated by an anticipated increase in the demand for steel for military purposes, not only for the extent of the European war, but also for use in the Japanese campaign due to revision of estimated requirements by the Army for its needs in the Pacific area. This move tends to strengthen the demand for scrap supplies and will tend to further reduce inventories of purchased scrap. Following this stoppage, it is possible that reconversion may not be attempted until victory in Europe is attained; if such is the case, stocks of scrap will not be enlarged to any extent before that victory.

When reconversion is permitted, there will be a lag in the need for scrap, thereby producing a lower rate of consumption; at that time there should be an influx of supplies sufficient to increase industry stocks to a safer level. After retooling for civilian products is accomplished, the demand for and use of scrap will again increase, although the quantity consumed may not equal the high level reached in production for strictly war purposes. Since the specifications for steel for civilian requirements are not as exacting as for military, the quantity of home-produced scrap at steel mills during and after reconversion will not be as great as at present. This may tend to increase the demand for purchased scrap, which would necessarily be supplied by the scrap dealers. At present no "battlefield scrap" is being returned to the United States, because of the lack of time necessary for loading; however, there is some agitation for returning the heavier grades of this scrap after the war is won and permitting the sale of the lighter material to foreign consumers. Should this procedure be followed, domestic supplies would be augmented considerably, and an ample backlog of available material provided for future use.

Looking at the entire scrap situation, the outlook for 1945 is not too bright and would indicate that the present high rate of scrap consumption will be maintained for at least the first half of the year and possibly longer. As a consequence, available supplies will continue to dwindle until they may reach an alarming point, creating a tight situation in the scrap market.

Scrap must be brought in in continuous flow to meet requirements

Nonferrous Scrap and Secondary Metals

The level of activity in the nonferrous secondary metals industry in 1944 was maintained close to the high rate achieved in 1943, with immense quantities of new scrap originating in industrial plants moving swiftly back into the stream of usable raw materials

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GENERATION and reclamation of aluminum scrap showed another large increase to what might turn out to be the greatest volume attained for many years to come, but the flow of other major types of nonferrous scrap—copper and brass, zinc, and lead—appeared to have reached its peak in 1943, and secondary metal recovery in each of these last-named classes receded slightly in 1944.

Supplies of most types of old and obsolete scrap-metal objects continued to dwindle, although lead storage batteries were an outstanding exception. The supply of fired cartridge cases and artillery shells more than doubled that in the preceding year, and brass mills, ingot makers, and refineries are believed to have consumed 100,000 tons.

Despite serious difficulties in obtaining labor, scrap-metal dealers were able to exceed their previous record in total nonferrous metal shipments by more than 4 percent. One factor that made this possible was the movement of large lots of segregated industrial plant scrap which needed no sorting and thus required far less labor than the mixed lots of old scrap that constituted the major portion of dealer business before the war.

Post-war planning designed to prevent dumping of surplus scrap metals and obsolete war materials held the public eye during the summer and fall. Programs were set up to route war-contract-termination scrap into industry if it was needed or to store it under Government ownership if it was of some type that could not be readily absorbed.

The Surplus Property Act of 1944, which became effective October 3, provided that all Government-owned accumulations of certain strategic minerals and metals (including scrap), when determined to be surplus, should be added to the permanent Government stock pile authorized by the act of June 7, 1939. Anxiety regarding the dumping of post-war inventories of scrap was largely relieved by this action, which, in effect, freezes the entire Government surpluses of copper, lead, zinc, tin, antimony, magnesium, nickel, and several other metals that are on hand at the end of the war. Some uncertainty exists as to the post-war status of Government-owned aluminum, as the Congress did not specifically provide for the freezing of this metal.

Copper and Brass

Reclamation of copper as refined metal, in brass and bronze as ingot, brass mill shapes, or castings and in various other products apparently dropped slightly in 1944 but still totaled at least 1,000,000 short tons, copper content. The quantity of scrap available, including both old copper and brass scrap from used metal objects and new scrap generated in manufacturing processes, was slightly less than in the previous year but exceeded 1,400,000 tons (gross weight, including alloy constituents, such as zinc, lead, and tin). The recovery of secondary copper in all forms in 1943 totaled 1,086,047 tons, copper content, and the gross weight of copper and brass scrap treated during 1943 was 1,533,823 tons. In each of the last two years about 40 percent of the secondary copper recovery was from old scrap and 60 percent from new scrap.

Brass ingot makers produced and shipped approximately 525,000 tons of ingot containing about 420,000 tons of copper; of this, almost 50,000 tons consisted of refined copper, and the remaining 370,000 tons were reclaimed by remelting scrap copper and brass. Ordinarily very little refined copper is consumed by brass ingot makers in their production of brass and bronze casting alloys; and even in 1943, when the copper and brass scrap supply was admittedly short, only about 12,000 tons of refined copper had to be used by the brass ingot makers. The large increase in refined copper requirements for this purpose during 1944 was caused partly by a somewhat reduced flow of the high-grade types of scrap and partly by an increased demand for brass ingot.

Refined Copper from Scrap in Smaller Quantity

Although data are so far quite incomplete, the quantity of refined copper produced from scrap at both primary and secondary refineries in 1944 appears to have been considerably reduced from the record of the preceding year.

Brass mills that had recovered 422,818 tons of copper in brass and bronze products from purchased scrap in 1943 probably could not quite equal this record in 1944, owing to a slightly reduced flow of scrap from wrought-brass fabricators. Even the use of fired cartridge cases, which early in the year began to move at an increasing rate to brass mills, was not enough to counteract the decline in the flow of new brass clippings and turnings. It is estimated that up to 60,000 tons of fired cartridge cases were purchased and consumed by brass mills

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during 1944, whereas less than 16,000 tons were consumed at the mills in 1943.

Other users of purchased copper and brass scrap, namely chemical works, foundries, and miscellaneous manufacturers, consumed about the same quantity as in 1943; as a matter of fact, there has been scarcely any change in the annual consumption of scrap by this group since 1942, and while full-scale war production continues no great change is to be expected. A considerable proportion of the direct use of copper and brass scrap by foundries consists of the reproduction of railroad bearing bronzes from old bearings supplied by the railroads, these materials thus being kept within the original use cycle.

The practice of smelting foundry residues and other types of low-grade scrap in cupolas to produce a copper-base-process ingot containing tin and lead usable as a foundation material for alloys such as 85-5-5-5 was continued at a high rate during 1944 and was of great importance in relieving the bronze-scrap shortage. A few additional small concentrating plants were set up to retrieve the metallics from foundry skimmings and the resulting concentrates were used in brass-ingot production instead of being refined for their copper content as was the practice before the war.

Scrap Dealer Problems

Scrap-metal dealers could again surpass previous records in shipping copper and brass scrap to consumers. Monthly statistics for the first 10 months of 1944, augmented by estimates for November and December, indicate that the movement of copper-base scrap from dealers to consumers totaled approximately 512,000 tons, gross weight, which may be compared with 488,436 tons shipped in 1942, and 496,943 tons moved in 1943. Demolition scrap, or that salvaged from old and worn-out metal objects, was available in smaller quantities, but new scrap generated as a by-product of manufacturing operations showed increased movement through dealers' hands. As usual, the greater part of the copper and brass scrap handled by dealers went to brass ingot makers. Most brass mill scrap consists of clippings and turnings produced by fabricators of wrought-brass products, who usually generate scrap in large quantities and ship segregated lots directly back to brass mills, so that the services of nonferrous scrap-metal dealers are not normally required to facilitate movement of this type of scrap. Nevertheless, about one-fifth of the total brass-mill-scrap movement was through dealers.

Stocks of copper and brass scrap in scrap dealers' yards ranged from the high point of 48,640 tons at the beginning of 1944, to a low of 41,400 tons at the end of February and toward the end of the year approximated 43,000 tons. Calculations based on a pre-war sample survey of scrap-metal dealers have indicated that normal dealer stocks are of the order of 70,000 tons. This brings out more clearly the fact that dealers' inventories of copper and brass scrap were reduced to a minimum working basis within 4 months after Pearl Harbor and suggests the possibility that dealers can absorb up to 30,000 tons more copper-base scrap if surplus materials should be dumped on the market at the end of the war.

Ceiling prices for copper and brass scrap were unchanged throughout 1944 except for reductions ranging from one-half to 1 cent per pound on five grades of yellow brass scrap on January 25. Early in the fall, when a flurry of false optimism concerning the possibility of an early peace in Europe struck American industry, the large scrap consumers, such as the brass ingot makers, cut down their buying and reduced their scrap inventories. For a short period, even items such as No. 1 red composition and unalloyed copper scrap experienced some movement at less than ceiling prices, but this condition was short-lived, and the year ended with full demand and top prices for the better grades. A number of the yellow brass grades, including some types of wrought turnings, seemed always to be in sufficient supply so that they were absorbed only at prices somewhat less than ceilings, but the difference was never enough to depress the market to any serious extent.

Government controls and allocation of copper and brass scrap were maintained as they had been throughout the war; although there was a noticeable tendency during the fall months to allow more copper to be used in certain civilian applications, the quantities released from strict war channels for production of essential civilian items did not amount to very much. The renewed concern about ammunition supplies toward the end of the year virtually stopped further routing of copper for any increased civilian use and caused restudy of the spot authorizations previously allowed.

Aluminum

With the aircraft-production program proceeding under full steam during 1944, record quantities of aluminum scrap were thrown into the circulating load of raw materials to be reabsorbed by industry. The gross weight of aluminum scrap remelted during the year totaled approximately 410,000 short tons from which about 370,000 tons of aluminum alloys were recovered, compared with 313,961 tons of secondary aluminum in 1943. About 350,000 tons of aluminum came from new scrap and not more than 20,000 tons from old or obsolete scrap. To utilize segregated sheet scrap to the best advantage, most of it was routed to aluminum rolling mills and other plants controlled by the primary aluminum producers, while the secondary aluminum smelters absorbed most of the turnings and mixed plant scrap, in addition to a smaller portion of segregated sheet clippings.

The reduced flow of old scrap (the smallest in over 5 years) went almost entirely to secondary smelters or ingot makers, because it was not until near the end of the year that foundries were allowed to buy aluminum scrap. Borings and turnings remelted by aluminum smelters totaled approximately 130,000 tons, and miscellaneous classes of new scrap, such as skimmings and grindings, totaled about 36,000 tons, leaving about 223,000 tons of scrap from the fabrication of sheet, extrusions, and other structural aluminum shapes. Very little of this was casting scrap because gates and risers are ordinarily remelted in the foundry as home scrap and thus are not included in secondary-metal statistics.

Scrap Segregation Program Important

The program of scrap segregation to which fabricators had been educated early in the war, continued to be eminently successful, and most of the scrap passing through commercial channels was of such high quality that it was accepted by the buyers as properly segregated. The technical progress of many of the aluminum ingot makers has advanced considerably in the last few years, and during 1943 and 1944 a substantial tonnage of segregated wrought scrap was remelted into ingot of low impurity content and sold to the primary producers who absorbed it, along with primary aluminum, in the production of wrought aluminum alloys to standard specifications. The production of so-called "primary" casting alloy ingots involving the use of both scrap and added primary metal was also continued at secondary ingot plants.

About 140,000 tons, or one-third of the total quantity of commercial

aluminum scrap used during the year, passed through scrap-metal dealers' hands. Although this indicates that, on the average, dealers were able to move almost 12,000 tons of aluminum scrap per month the supply slightly exceeded industry's ability to absorb it, and dealers' stocks of aluminum scrap rose from around 25,000 tons at the beginning of 1944, to more than 50,000 tons at the end of the year. This may be compared to dealers' normal pre-war stocks of aluminum scrap of less than 4,000 tons.

Wrecked Aircraft Problem

Wrecked aircraft scrap purchased by dealers at extremely low prices was one factor that contributed to the rise in stocks, but since the quantity of wrecked aircraft stored by dealers at the end of the year could not have weighed much over 15,000 tons it is obvious that this was not the sole cause, despite what many dealers appeared to believe. The term "wrecked aircraft" covers battle scrap returned to the United States in considerable bulk during the first 9 months of 1944, as well as old or obsolete airplanes, crash metal, and dismantled parts from repair work at our own training fields. No real outlet has yet appeared for the absorption of aluminum from old airplanes, and purchases of this type of old scrap by secondary smelters ran to only a few hundred tons per month, which is used for deoxidizing aluminum ingot and shot. The labor shortage among scrap-metal dealers was such that practically no experimental preparation and sorting of storage piles of old airplane sections could be attempted, but with wrecked aircraft being sold at Army salvage centers on open bids, large lots could be acquired at very low prices and speculative buying was the rule. Calculations based on a large number of dealers' purchases of wrecked aircraft during the first half of 1944 indicated that the average price paid was about $12.50 per ton. Sales of wrecked aircraft by the Government virtually ceased on October 2, 1944, when the Surplus War Property Administration ruled that henceforth bids below $25 a ton would be rejected.

Zinc

Secondary zinc recovery in 1944 showed very little change from the preceding year, with preliminary estimates indicating the recovery of approximately 366,000 tons compared with 368,488 tons in 1943. Although the zinc content of brass and bronze scrap is expected to show a decrease of about 6,000 tons to total 238,000 tons, the zinc in zinc-base scrap and residues treated during 1944 rose at least 4,000 tons to about 128,000 tons and compensated for most of the difference.

About one-third of the secondary zinc (including zinc in brass) recovered in each of the last three years, 1942, 1943, and 1944, came from zinc-base scrap and residues, with the other two-thirds measured as recoverable zinc in brass and bronze scrap. In 1941 the ratio was 55 percent from zinc-base scrap and 45 percent from brass. Curtailment of galvanizing and increased use of brass for munitions accounted for this abrupt change in proportions.

Consumption of zinc-bearing flue dust and chemical residues by zinc distillers and pigment manufacturers in 1944 increased more than 10,000 tons (gross weight) from the 47,725 tons used in 1943. The supply of galvanizers' dross and skimmings also increased to some extent, and the gross weight of all zinc-base scrap and residues consumed approached 200,000 tons compared with 185,752 tons reported the year before.

Recovery of zinc from scrap by distillation rose from 70,127 tons actual secondary zinc content of refined metal in 1943, to an estimated 71,200 tons in 1944, with 48,400 tons emerging in slab form and 22,800 tons in zinc dust. Forming dies made of zinc-base alloys, used for stamping aluminum sheet in the aircraft industry, constituted both an outlet for remelt zinc and a new source of heavy zinc scrap, although a much greater flow of obsolete dies may be expected some time in the future, whenever the production of warplanes undergoes a major cut-back.

Control of scrap and remelt zinc was relaxed in February, 1944, when these items were expunged from restrictive orders, but other types of zinc materials remained under allocation. Ceiling prices for zinc scrap remained unchanged from those set in 1941, with new zinc clippings at 7.25 cents a pound. Dealers' buying prices for zinc clips at New York were quoted at close to 6 cents a pound throughout the year.

As usual, most of the metallic zinc scrap was supplied by scrap-metal dealers, while the bulk of dross and residues moved directly from manufacturing plants to smelters or chemical works. Dealers' shipments of zinc-base scrap and residues ranged between 3,000 and 4,000 tons per month, with the total divided evenly between metal scrap and residue items.

Lead

According to preliminary figures, a reduced supply of old scrap lead pipe, cable covering, sheet lead, type metal, and other solid metal items resulted in a 16,000-ton drop in secondary lead recovery to 325,000 short tons in 1944 compared with 341,243 tons in 1943. Consumption of lead drosses and battery plates together increased about 22,000 tons (gross weight), but the decline of 28,000 tons of the higher grades of solid-metal scrap more than canceled this advance.

In many instances, shortage of labor for breaking up old batteries and for running lead blast furnaces caused orders for antimonial lead that ordinarily would have been filled by secondary metal to be met by alloying primary lead, because so much less labor was involved at the moment. Plenty of old batteries were available, but getting them smelted was a different matter. Both domestic primary lead production and lead imports showed a declining trend toward the end of the year, and secondary production was finally stepped up during the last quarter, but the revival came too late to compensate for the reduced output of lead from scrap in the earlier months.

Smelting of battery plates involved consumption of an estimated 238,000 short tons (gross weight) in 1944, compared with 229,065 tons of plates used in 1943, and over 62,000 tons of lead drosses were processed by smelters and refiners, a 13,000-ton increase over the 49,901 tons used in the previous year. Supplies of soft lead scrap, hard lead, and old type metals each fell off about 4,000 tons, while solder scrap dropped 6,000 tons and cable lead scrap declined 10,000 tons to total less than 8,000 tons available in 1944.

Scrap metal dealers' shipments of lead-base scrap and residues totaled 292,000 tons (preliminary figure), with peak operations near the end of the year and the smallest movement in April and July. Dealers' stocks of lead scrap were highest on the first of January and at the end of September, the lowest point occurring at the end of May.

Ceiling prices for lead scrap were unchanged throughout 1944, and the solid-metal-scrap buying prices maintained good levels owing to steady demand. Prices for battery plates reflected an excess supply late in the fall, with a drop in quotations from 2.87 cents to 2.37 cents a pound, and battery smelting charges rose from $24 to $30 a ton during September and October.

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ASK GOVERNMENT OFFICIALS

and they will tell you...

Mines must Mechanize to Win Post-War Markets

BETTER COAL PREPARATION* is a post-war *must*—because *in a buyers' market* clean coals, of low impurity content, correct sizing and high uniformity will have *all the selling advantage!*

Morrow Tipples Improve Quality, Raise Product Value— Cut Operating Costs

About ⅓ of the mines in this country are mechanized. Of that ⅓ a very high percentage are Morrow equipped. That's because Morrow *streamlines production of coal* from the mine, through most modern, efficient preparation equipment, to cars and barges in shorter time, at lower operating costs—*in the best condition to SELL!*

Morrow engineers are available *now* to design and equip more efficient preparation plants for post-war operations. Ask Morrow to assign an engineer to study your situation. Write The Morrow Manufacturing Company, 1980 Ford Boulevard, Wellston, Ohio. *Division The Wacker Corporation.*

* Better Preparation
= INCREASED SALES!

1. low impurity content
2. correct sizing
3. high uniformity

MECHANIZE WITH MORROW

COAL WASHERS • WEIGH PANS • FEEDERS • DUMPS
BINS AND BIN GATES • FLANGED LIP SCREENS
CONVEYORS • LOADING BOOMS • SHAKING SCREENS
VIBRATING SCREENS • CAR HAULS • PICKING TABLES
SETTLING TANKS • ELEVATORS • CAR RETARDERS
PERFORATED METAL SCREENS • STEEL STRUCTURES

WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

Washington Highlights

CONGRESS: Organizes for work.

LENDING AGENCIES: Separated from Commerce Department.

MANPOWER: May "work-or-fight" bill a storm center.

MINERAL POLICY: State Department speaks.

STOCKPILING: Army-Navy Munitions Board reports.

PREMIUM PRICES: Sen. Hayden introduces bill to extend.

BRETTON WOODS: Banker's Association has a plan.

QUASI CONTRACTS: Regulations for claims published.

POTASH: Drastic new leasing regulations announced.

AS THE President sped to confer with Churchill and Stalin "in the vicinity of a Black Sea port" and news from the Philippine and German war fronts became increasingly encouraging, the Senate took action on the Jesse Jones-Henry Wallace controversy by divorcing the Federal lending agencies from the Department of Commerce and postponing further consideration of Wallace's appointment as Commerce Secretary until March 1.

The Presidential inauguration was a quiet affair, in keeping with the need for simplicity in the present wartime emergency, and was quickly followed by completion of the Senate and House organization, thus putting the Congress in readiness for a busy legislative session.

79th Congress Organizes

A number of the changes in committee membership in the organization of the new Congress are of interest to mineral producers. In the Banking and Currency Committee of the Senate, Senators McFarland of Arizona, Taylor of Idaho, and Fulbright of Arkansas are new majority members while on the minority Millikin of Colorado, and Hickenlooper of Iowa are new appointees. The Committee on Education and Labor has as its chairman Senator Murray of Montana while its former chairman, Elbert Thomas of Utah, now heads the Committee on Military Affairs. Banking and Currency handles RFC mine loan bills, extension of the price and wage stabilization law and will have the Bretton Woods proposal, while Military Affairs has jurisdiction of the Contract Termination and Surplus Disposal bills and has charge of legislation affecting strategic and critical metals and minerals. New members of the Finance Committee which handles revenue, social security, tariff and reciprocal trade agreement bills are McMahon (Dem., Conn.), and minority members Bushfield of South Dakota and Hawkes of New Jersey.

On the important Committee on Ways and Means in the House there is one addition to the majority in Representative Anderson of New Mexico and two replacements on the minority side in Representatives Gifford of Massachusetts and Curtis of Nebraska. Shifts in three other committees of importance to mining have made Representatives Compton White of Idaho chairman of the Committee on Coinage, Weights and Measures; John R. Murdock of Arizona, Chairman of the Committee on Irrigation and Reclamation; and Andrew Somers of New York, Chairman of the Committee on Mines and Mining.

House and Senate leaders remain the same as in the 78th session with the exception, of course, of the new vice president as president of the Senate.

Manpower

The President's message to Congress urging an immediate tightening, by legislative measures and administration, in the furnishing of manpower to the armed forces and to essential and critical activities brought quick action through War Mobilizer Byrnes and the Selective Service System. However, in the induction of men for the armed forces from the 26-29 age group the War Manpower Commission's new list of essential and critical activities gave high rank to coal mining, metal mining, milling and smelting, war-essential nonmetallic mining and the mining machinery industry.

Chairman May of the House Committee on Military Affairs introduced a limited national service bill which would have classified as immediately available for induction registrants 18-45 leaving war work without approval of their local boards. Under the bill an inventory of deferred registrants by age groups and other status would be maintained by Selective Service, and local boards would be called upon to request registrants to take employment in war plants requiring additional manpower—thus affording replacements for the increasing number of men up to 30 that will be taken by the armed forces.

As reported by Chairman May's committee and passed by the House after the rejection of repeated attempts at amendment, the bill has been dubbed the "work-or-be-prosecuted" Act because of its rigid provisions, carrying penalties of maximums of five years in jail or of $10,000 fine as provided by the Selective Training and Service Act of 1940. However, on first consideration the Senate Committee on Military Affairs tentatively agreed to put control of manpower placements in the hands of OWM Director Byrnes, knowing that this would result in Byrnes' placing the War Manpower Commission in charge of the administration of the law. The Committee is now conducting hearings in executive session prompted by protests from the Army, Navy, WMC, WPB, and Selective Service, and the final form which the bill will take remains in doubt.

U. S. Foreign Mineral Policy

An interesting position on mineral policy was recently voiced by Charles P. Taft, Director of the State Department's Office of Wartime Economic Affairs in his address before the annual meeting of the Colorado Mining Association in Denver. Viewing the end of the war, Taft stated that the mining industry should understand the foreign policy of the United States in order that producers may have confidence in going forward with the winning of the war. He said frankly that when cutbacks come in requirements of raw materials it is obvious that high cost production must go first but that the purchasing agencies should taper off such production, on an agreed basis if possible but on a fair basis in any event. He denied the charge that the State Department is in favor of a continuance of foreign purchases while domestic mines are shut down, saying "We do take the position that the producers should be treated with justice in the cutting back or termination of existing contracts. That means that all high cost mines here or abroad should be treated alike, in our judgment. If they are closed down or cut back here they should be closed down or cut back abroad, and vice versa. When the requirements cease, they should all be closed down."

Speaking of the problem of postwar surpluses and the providing of strategic materials stocks for a future emergency, Taft said that whether we want a security stockpile or not we are certainly going to have one, and that "in many cases we shall have on hand in government or private ownership two or three years' supply above the normal pipeline for peacetime demands. Congress has recognized the danger which that creates for employment in extraction and refining, by freezing such stocks until a year from this spring. But what then?

"A frozen security stockpile subject only to Congressional release has been often proposed and widely discussed within and without the Government. . . . Such a stockpile should be fixed in amounts by the competent authorities for direct military and indirect industrial needs, in case of emergency."

Taft concluded by saying "It is clear therefore that we can appropriately consider the proposal for a security stockpile on its own merits now. It becomes, if set up by Congress, an additional factor to back up the peace-loving nations in their support of the world organization, and to insure that no anti-social minority will again wish to make war."

Munitions Board's Report

The Army and Navy Munitions Board's report to Congress on stockpiling, now available as Senate Document No. 5, has been made in accordance with Section 22 (d) of the Surplus Property Act of 1944 which specifies as follows:

"Within three months following the enactment of this Act the Army and Navy Munitions Board shall submit to Congress its recommendations respecting the maximum and minimum amounts of each strategic mineral or metal which in its opinion should be held in the stockpile authorized by the Act of June 7, 1939 . . ."

The report treats of the necessity for stockpiling in the light of past experience, depletion of the nation's natural resources, war shipping and the problem of Naval escorts, and discusses the expanded requirements in war for strategic materials and the effect of shortages on war-time efficiency. A strong statement is made to the effect that "the ultimate goal of the Army and Navy Munitions Board is a sufficient supply of materials so that this nation, in event of a future emergency, can develop an efficient military machine in the shortest period possible, and, at the same time, maintain a sound civilian economy."

Referring to the problems of World Wars I and II the report states that much effort and time could have been saved for other important tasks if a program had been started well in advance of the war to accumulate strategic raw materials and to plan for the expansion of facilities for their production. It says, moreover, that during the last two major conflicts this country has been fortunate in having access to large foreign sources of raw materials in friendly countries. A different alignment of nations in a future war, involving enemy control of different geographic areas, might drastically curtail the movements of such materials into the United States, says the document.

Commenting on future stockpile legislation the Board makes the recommendation that certain "undesirable features" of established policies relating to the procurement and release of materials for government stockpiling be eliminated and makes the particular argument that statutory domestic preference requirements allowing a year for deliveries from domestic production and the preference for domestic materials, as provided in the Act of June 7, 1939, and the Buy American Act, respectively, are too restrictive. Contention is made for the relaxation of such requirements and a plea is entered to permit the disposal of materials in stockpiles which have become obsolete, due to technological developments, as well as to permit rotation of those which are subject to deterioration.

Premium Metal Prices

Senator Carl Hayden of Arizona, joined by Senators McFarland (Ariz.), Scrugham (Nev.), Johnson (Colo.), Murray (Mont.), Murdock (Utah), Thomas (Utah), Thomas (Idaho) and Hatch (N. M.), has introduced a bill to authorize the continuation of subsidy payments with respect to strategic and critical metals and minerals and petroleum and petroleum products. In the House a companion measure is sponsored by Representatives Harless (Ariz.), Engle (Calif.), and John R. Murdock (Ariz.). The Taft amendment added last spring to the Price Stabilization extension bill prohibited the payment of subsidies after June 30, 1945, unless the Congress authorized them by specific provision. The essential part of the Hayden-Harless bill as introduced and referred to the Committees on Banking and Currency of both Houses reads:

"The last paragraph of Section 2 (e) of the emergency Price Control Act of 1942, as amended by the Stabilization Extension Act of 1944, shall not apply to the operations of the Reconstruction Finance Corporation, or any corporation created by it pursuant to Section 5(d)(3) of the Reconstruction Finance Corporation Act, as amended, with respect to strategic and critical minerals and metals, or petroleum and petroleum products, during the fiscal year ending June 30, 1946. With respect to such operation during the fiscal year ending June 30, 1946, such corporations may pay subsidies and incur losses not in excess of $450 million in the aggregate."

Officials of the Metals Reserve Company as well as WPB and OPA are known to believe that an early announcement of the further extension of the Premium Price Plan is desirable.

Monetary Stabilization—World Bank

As the time approaches for introduction of legislation to carry out the Bretton Woods proposal for an International Monetary Fund and a World Bank for Reconstruction and Development, it is known that there have in the past several weeks been Treasury and White House discussions, participated in by Secretary Morgenthau, Secretary of State Stettinius, Senate Banking and Currency Committee Chairman Wagner, U. S. Chamber of Commerce President Eric Johnston and Winthrop W. Aldrich, President of Chase National Bank.

(*Continued on page 136*)

Personals

At the annual meeting of the Oregon Mining Association in Portland **S. H. Williston** was elected president, **Irving Rand** was elected vice president and secretary, and **Worthen Bradley, D. Ford McCormick** and **F. Whalley Watson** were elected directors.

L. C. Campbell, vice president of Eastern Gas and Fuel Associates, Koppers Coal Division, with executive offices in Pittsburgh, has promoted **M. A. Evans,** formerly chief engineer, and **H. J. Harper,** formerly assistant general manager of mines, to assistants to the vice president in direct supervision of the division's 19 mines in West Virginia, Pennsylvania and Kentucky.

Mr. Evans will have supervision of Helen, Stotesbury, Glen White, Long Branch, Carswell, Maitland, Keystone, Federal No. 1 and Federal No. 3 mines in West Virginia.

Mr. Harper will supervise Powellton No. 6, Powellton No. 3, Beards Fork, Midvale, Wharton and Kopperston mines in West Virginia; Butler Junction, Melcroft and Sonman shaft and slope mines in Pennsylvania, and Weeksbury mine in Kentucky.

Stephen Krickovic, formerly assistant chief engineer, has been appointed chief engineer by Mr. Campbell.

Aldon J. Anderson, assistant to the general manager of the United States Smelting, Refining & Mining Co. since 1938, has left the company to establish the Equipment Supply Co., Salt Lake City, to specialize in industrial and safety equipment and supplies.

Grover J. Holt, of Ishpeming, Mich., has been appointed chief engineer for the Cleveland Cliffs Iron Co. in Minnesota and Michigan.

William Lacey has been appointed assistant general superintendent and safety director of the Black Diamond Coal Mining Co. He was formerly superintendent at Whitwell, Tenn., for the Tennessee Products Corporation.

Dr. G. M. Schwartz, professor of economic geology at the University of Minnesota, has returned to his classroom work. He has been investigating copper deposits and directing exploratory work on porphyry ores for the U. S. Geological Survey in Colorado and Arizona since June 15, 1944.

S. L. Mather, vice president of the Cleveland Cliffs Iron Co., has succeeded **Max H. Barber** as vice president in charge of all of the company's mining operations. Mr. Barber retired January 1.

S. L. MATHER

Dr. Marvin R. Evans, Coaldale, Pa., has been named chief surgeon for the Lehigh Navigation Coal Company to succeed the late **Dr. Robert H. Kistler.**

William Ford has been appointed superintendent of Mines Nos. 3 and 8 of the Eastern Coal Corporation, Stone, Ky. He was formerly superintendent of mines of the Alma Fuel Company and the Dayton Coal Company in Mingo County, W. Va.

The appointment of **L. M. Parsons** as assistant to vice president, sales, of United States Steel Corporation of Delaware, effective immediately, was announced January 9 by **Avery C. Adams,** vice president, sales. Mr. Parsons will be located at Washington, D. C.

The Controllers Institute of America has announced the appointment of **Herbert P. Buetow** as chairman of its committee on technical information and research. Mr. Buetow is treasurer of the Minnesota Mining & Mfg. Co., St. Paul.

Rufus McKee has been promoted from the position of assistant mine foreman to general mine foreman of No. 7 mine of the Eastern Coal Corporation at McVeigh, Ky.

Lester E. Lighton, manager, Department of Development and Design, the Electric Storage Battery Company, Philadelphia, was recently elected vice president of the company in charge of engineering.

Grover J. Duff was recently appointed manager of western mining operations for Eagle Picher Mining & Smelting Co., with headquarters at Tucson, Ariz. **E. H. Crabtree,** mill superintendent at Sahuarita, Ariz., has been promoted to chief metallurgist.

Herschel Daffron, resident engineer for the Tennessee Products Corporation, has been named superintendent of the corporation's No. 1 and No. 9 mines. **George McCaa, Jr.,** has been made superintendent at the new mine at Whitwell, Tenn.

Orville R. Lyons, formerly research engineer at Battelle Memorial Institute, has become washery superintendent and coal preparation engineer for Republic Steel Corp., at the Clyde washery, Clarksville, Pa.

Dr. W. J. Mead, head of the department of geology at Massachusetts Institute of Technology, was recently placed in charge of the coordination and expansion of all research activities of the Reynolds Metals Co.

John Raymond has succeeded **O. A. Coleman** as superintendent at the Esco mine, Utilities Elkhorn Coal Co., Pikeville, Ky. He was formerly general foreman.

Everett C. Hite has been appointed combustion and refractories engineer in the Steel Mill Metallurgical Department of the Timken Roller Bearing Company, Canton, Ohio, according to an announcement made by **Gilbert Soler,** superintendent of quality.

Gregory L. Oliver, associated with the Miami Copper Company since 1918, has been appointed assistant general manager of the company and of the Castle Dome Copper Company, Inc., advancing from the position of secretary to **R. W. Hughes**, general manager.

Other personnel changes are: **B. R. Coil**, general superintendent of Castle Dome, promoted to a like office for both companies; promotion of **J. C. Van De Water**, assistant mine superintendent at Castle Dome to superintendent; **J. H. Harris**, from general mine foreman at Miami Copper to mine superintendent; **W. F. Distler**, stope engineer, appointed assistant mine superintendent at Miami Copper; and **E. G. Williams**, Miami Copper mine foreman, appointed general mine foreman for the Miami district.

Robert F. Duemler, chief of the Anthracite Distribution Division of the Solid Fuels Administration, has resigned to accept the vice presidency of the Delaware, Lackawanna and Western. He succeeds **Alvin W. Decker**, who was with the company for many years and who died August 9, 1944.

L. A. Larson, formerly district manager out of Milwaukee, has been promoted to area manager for Barber-Greene's Area No. 6, which includes Wisconsin, Minnesota, North Dakota, South Dakota, Montana, Wyoming, Nebraska, Iowa, and a section of northwestern Illinois. Mr. Larson will headquarter in Minneapolis.

Clifford McIntosh, formerly chief inspector for the Great Northern Iron Ore Properties at Marble, Minn., has been appointed assistant chief engineer. **C. J. Calvin** is chief engineer.

R. L. Littlefield has been appointed assistant superintendent and safety engineer for the Boothton Mining Co. He was formerly night foreman at Boothton No. 2.

Harry E. Krumlauf, since 1928 a staff member of the Michigan College of Mining and Technology, has been appointed associate professor of mining engineering at the University of Arizona.

The Wickwire Spencer Steel Company has announced the election of **Robert T. Dunlap** as a member of the Board of Directors. Mr. Dunlap has been associated with Wickwire Spencer since 1943. He is also vice president in charge of production of Wickwire Spencer.

The appointment of **Orville R. Lyons** as preparation engineer in the northern coal mines of Republic Steel Corporation was announced today by **J. L. Hamilton**, manager, Republic's northern coal mines.

Mr. Lyons is a graduate of the University of North Dakota in mining engineering and geology and received a master's degree in mining engineering at the University of Alabama in 1940.

Appointment of **J. E. Savacool**, vice president and comptroller, as a member of the board of directors of Mack Trucks, Inc., has been announced by **L. G. Bissell**, board chairman. **John H. Middlekamp**, recently resigned director of the Automotive Division of the War Production Board, has been appointed manager of the Government Department of Mack Trucks, Inc., according to **C. T. Ruhf**, president.

— *Obituaries* —

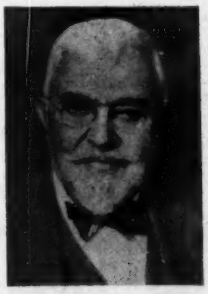
John Bigelow Moore, 55, president of the Reliance Coal Mining Co., died January 10 at Uniontown, Pa. His home is in Point Marion, and he was also president of the Fancy Hill Coal Co., Lake Lynn.

George S. Whyte, 77, chairman of the board of the Macwhyte Company, died December 15 at Kenosha, Wis. He began work in Scottish coal mines

at the age of 12 and in 1896 became part of the Leschen Macomber Whyte Rope Company at Coal City, Ill. In 1912 the Macomber and Whyte Rope Co. began business in Kenosha.

Arthur J. Morse, founder and president of Alloy Steel & Metals Company, died January 17 at San Juan Capistrano, Calif.

Thomas W. Bacchus, 82, retired vice president and director of Hercules Powder Company, died December 30 at Wilmington. Mr. Bacchus resigned



from Hercules in 1941, after 47 years of distinguished service in the explosives industry.

He was born in Sandback, Cheshire, England, in 1862, came to America in 1887, and went to work for the original Hercules Powder Company in Cleveland, in 1893, as a salesman.

He joined the E. I. duPont de Nemours and Company in 1902, and in January, 1903, was placed in charge of its Repauno plant. Under his direction, many chemical and mechanical improvements were made in the art of manufacturing explosives.

Edward F. Austin, well known in the mining machinery business, died January 17 at his residence in Pittsburgh, Pa. Since the turn of the century Mr. Austin had been active in the development and sale of mining

machinery, having designed and patented the Austin line of mine gathering pumps. He was associated with the Dravo-Doyle Company of Pittsburgh for some 20 years, and for the past 16 years had been a vice president and Pittsburgh district manager for the Brown-Fayro Company, of Johnstown, Pa. Mr. Austin was a member of the American Mining Congress and the Engineers' Society of Western Pennsylvania.

Ralph J. Edmiston, sales engineer for United States Graphite Co., Saginaw, Mich., for 27 years, died January 28 at Pittsburgh, Pa.

The loader with the natural, smooth, easy, shovel-action loading head.

IF YOU ARE INTERESTED IN MECHANICAL LOADERS--

● When buying equipment as vital to mining as mechanical loaders you want to know who and what is back of the machine you choose.

For over thirty-seven years Myers-Whaley have been doing one, and only one, job—that of building mechanical loaders. Our engineers have devoted their time and effort exclusively to mechanical loading problems of mining since 1908. It was then that Myers-Whaley installed the first commercially successful loading machine in the coal industry.

From the beginning our constant purpose has been to do a better job of mechanical loading. Through these years of concentrated experience many great improvements, of course, have been made in our machines.

Today, the Whaley "Automat" is recognized as a machine with important advantages not to be had in any other make. Advantages that have been thoroughly tried and proved satisfactory in meeting the service requirements of greater production at lowest cost.

If you are interested in mechanical loaders, you are interested in the "Automat" and the experience behind this machine. If you are planning the installation of loaders within the next 24 months, write to us now giving us information on your mining conditions. Myers-Whaley Company, Knoxville 6, Tennessee.

NEWS and VIEWS

Heavy duty equipment carries on the task of supplying copper ore to the hungry war machine at Phelps Dodge Corp's Morenci mine in Arizona

Eastern States

Anti-Freeze for Anthracite

Anthracite producers report an increased demand from dealers for coal shipments that have been treated with an anti-freeze to facilitate unloading at destination. Substantial tonnages of rock salt have been ordered for the foregoing purpose. It is expected that more treated coal will be shipped this year than ever before. Experience has proved that rock salt is effective as a soot remover, because it lowers the ignition temperature of the soot. Under these conditions, the soot burns more easily when supplied with sufficient oxygen and exposed to the heat of the fire.

Stream Pollution

An extensive program to eliminate pollution of the streams in Pennsylvania has been approved by the Post-war Planning Commission, Governor Martin states. A "substantial sum" more than the $2,000,000 appropriation will be sought from the 1945 General Assembly to carry out the project. It is planned to establish sewage disposal authorities to aid municipalities in carrying out the necessary plans to clear the streams.

Low Absenteeism Praised

Dr. C. J. Potter, Deputy Solid Fuels Administrator for War, speaking at a dinner in Hazleton, paid tribute to the mine production committees for their work in preventing absenteeism. He said "the high production figures and low rate of absenteeism is proof of the good work these committees are doing." Dr. Potter said the anthracite industry has a smaller proportion of absenteeism—less than 7 percent—than many other coal fields.

Strip Mine Regulations

Complete regulation and control of strip mining operations in Pennsylvania by the Department of Mines was recommended by a sub-committee of the joint state government commission, a legislative research agency. It is planned to draft the necessary legislation to prosecute the recommendations. The proposed bill will require mine operators who plan strip mining to obtain permits and file bonds to insure compliance with rules and regulations to be established by the State Secretary of Mines. Under the requirements of the bill, the Secretary of Mines will be authorized to enforce levelling, replacing, and refilling strip pits in a manner that is practical, feasible and necessary to minimize the hazards of floods, pollution of lakes, rivers and streams.

New P & R Directors

Judge William H. Kirkpatrick appointed a board of directors for the new Philadelphia and Reading Coal and Iron Company, created under the company's financial reorganization plan. Those named on the board are: Ralph Taggart, president, Philadelphia; Arthur E. Newbold, Jr., Philadelphia; Pierpont V. Davis, New York; Patrick H. Burke, Shenandoah; John P. Reichard, Shamokin; and Nickolas G. Roosevelt, Evan Randolph, Richard P. Brown, and Arthur Littleton, all of Philadelphia.

Packaged Fuel Available Soon

J. L. Mooney, manager of the packaged fuel division of Blaw Knox Company, advises that a site has been secured at 17th Street and Sedgley Avenue, Philadelphia, which has both Pennsylvania and Reading railroad sidings. They expect to place their new product, containing 80 percent or more of anthracite fines, on the market early in February.

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Mine Mechanization
Mine Management
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You'll notice the difference in faster drilling speeds, in cleaner and truer cutting, in longer performance, in lower labor and footage costs. These advantages are due to TRUCO'S scientific design; fine quality, carefully selected diamonds; a matrix of TRUCO patented metal with its high resistance to abrasion; and the ability of TRUCO Bits to stay on the job longer and to avoid breakdowns which necessitate superfluous rod pulling. And when resetting becomes necessary, you'll notice another money-saving advantage in the fact that TRUCO Bits are designed to provide exceptionally high diamond recovery.

Whether your drilling calls for coring, blasting, pilot or casing bits, you'll find in the complete line of TRUCO Drill Bits the correct size and type for your job. Specify TRUCO and you'll get real money-saving performance

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Coal Mining Institute of America

THE 58th annual meeting of the Coal Mining Institute of America was held in Pittsburgh, December 7-8. Principal subjects for papers and discussions were: Coal Mine Fires; Ventilation; Main Line Haulage; and "Is Mechanical Loading Safer Than Hand Loading?"

Coal mine fires were discussed from three viewpoints: electrical installation; fire-fighting equipment and procedure; effect of the ventilation system. Ventilation was reviewed from the standpoints of: fan installations, including value of standby fans; large boreholes as auxiliary ventilation aids and escapeways; multiple versus single fan installations.

Main line haulage received attention from several angles: Costs per ton-mile; operating schedules; maximum acreage tributary to one shaft; proper track; dispatching; double track; lighting and electrical equipment. Arguments pro and con were presented relative to the comparative safety of hand and mechanical loading.

Charles E. Lawall, president of the West Virginia University, was introduced at the annual dinner by E. A. Holbrook, dean, School of Engineering, University of Pittsburgh. He predicted a bright future for the coal industry in the advances of mechanization and better preparation and noted the need for a sound promotional program and for attracting more young technical experts to the industry. He complimented the industry for its activity in public relations and research.

Guests at the dinner, prominent in the promotion of coal mine safety, included heads of mining departments of three states: Dr. J. J. Rutledge, chief engineer, Maryland Bureau of Mines; Richard Maize, Secretary of Mines, State of Pennsylvania; and Jesse Redyard, chief of the West Virginia Department of Mines.

Election of new officers placed John M. Connor, West Penn Power Co., Pittsburgh, as president to succeed G. J. Steinheiser, state mine inspector, Uniontown, Pa.

1945 OFFICERS

President

John M. Connor, Pittsburgh, Pa.
West Penn Power Company

Vice Presidents

G. W. Grove, Pittsburgh
U. S. Bureau of Mines

C. A. McDowell, Pittsburgh
Coal Division, Jones & Laughlin Steel Corp.

C. M. Donahue, Pittsburgh
Mine Safety Appliances Co.

Secretary-Treasurer

J. A. Younkins, Pittsburgh
Coal Division, Duquesne Light Co.

Managing Directors

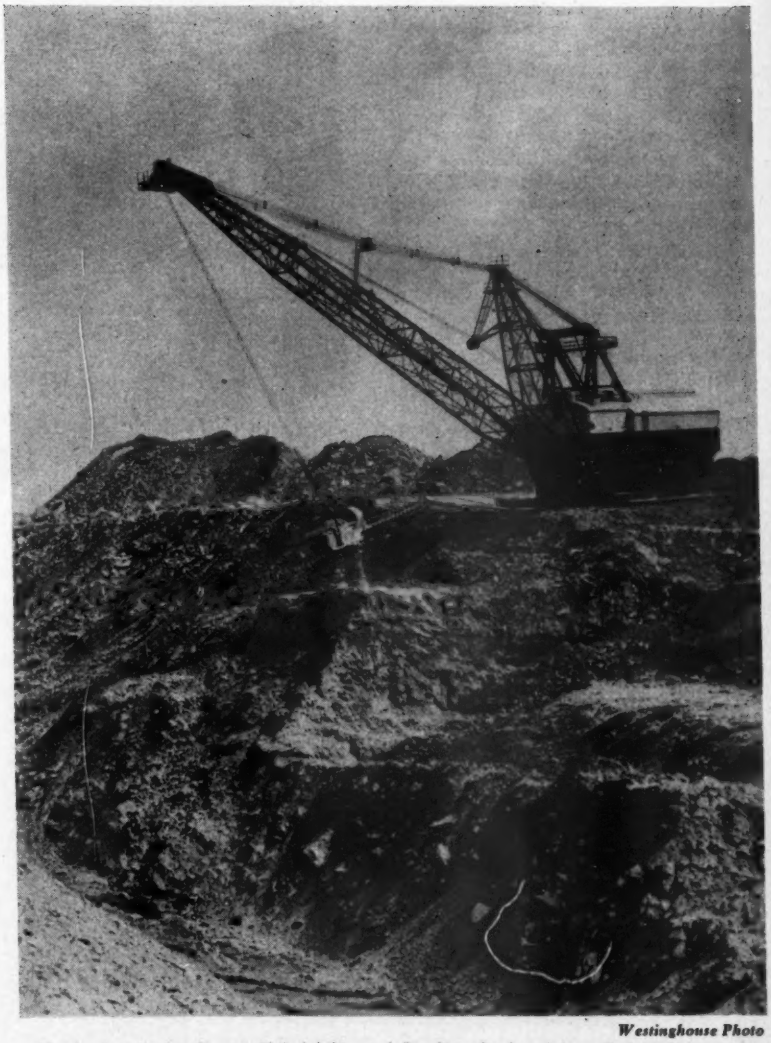
J. L. Hamilton, Uniontown, Pa.
Coal Division, Republic Steel Corp.

M. L. Coulter, Indiana, Pa.
Coal Division, New York Central R.R.

George Steinheiser, Uniontown
State Mine Inspector

John L. Sullivan, Uniontown
General Superintendent, H. C. Frick Coke Co.

R. H. Nicholas, Library, Pa.
Mine Inspector, Pittsburgh Coal Co.



Westinghouse Photo

25-yd. electric dragline at Philadelphia and Reading Coal and Iron Co.'s project near Minersville, Pa., has two 425 hp. motors on the drag, two 425 hp. motors on the hoist and three 125 hp. motors on the swing. Rototrol control is used on all three motions. It can dig 110 feet deep and transfer load 360 feet to dumping spot

Butler Brothers have announced the removal of their Cleveland office to 1703 Terminal Tower, Cleveland 13, Ohio, effective January 3.

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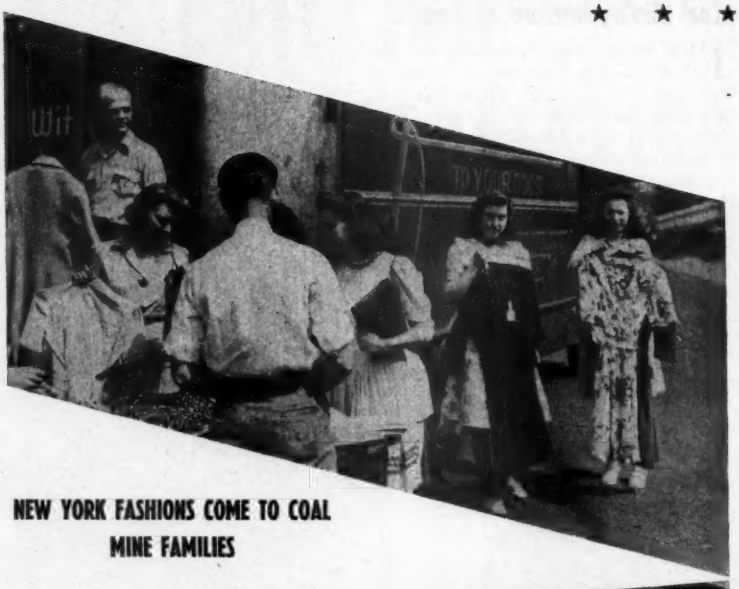
World Premier of "Power Unlimited"

On January 17, Island Creek folks were treated to a world premier showing of the coal picture "Power Unlimited" at the Pioneer Theater at Holden, W. Va. The picture was filmed at Holden and vicinity by Pathe News.

It tells the story of life in coal towns and is a part of the Pathe News "This is America" series. It portrays the important part that bituminous coal plays in the war effort, and is No. 3 in the third series issued by Pathe.

"Power Unlimited" is the first film to show the impact of coal on the daily lives of every individual in America. It is the story of the transformation of coal into products that have not only enriched our lives, but saved them. The picture shows the vast mine fields, the men and machines that dig the coal; its transportation to mills, foundries and factories; its conversion into coke for iron and steel; and the modern miracles of chemistry that convert the formerly dissipated smoke into drugs, medicines, dyes, cosmetics, perfumes, plastics and other products. The film shows where and how miners and their families live and the efforts of operators to make their living comfortable in the company towns. It also shows the independent miner-farmer who owns his own home. Needless to say, the Pioneer Theater at Holden had capacity audiences for the several showings of the picture. Some mining companies have arranged, by payment of a moderate sum, for special showings of the film in their own communities and consumer areas, with excellent results.

★ ★ ★



NEW YORK FASHIONS COME TO COAL MINE FAMILIES

The latest in women's styles arrive in the bituminous coal mining town of Holden, W. Va., on a unique door to door service. Miner's wives and daughters buy the very latest in coats and dresses "only 48 hours from New York." Prices range from $5.98 to $12.98 for dresses and $22 to $350 for coats. The truck carries a $10,000 stock and serves 4,000 women in the bituminous coal area. Visits are made every month

—Hamilton Wright Photos.

Petition Return of Coal Properties

It is reported that a petition filed in the office of Robert Permar, deputy United States clerk, by the Wheeling Valley Coal Co., Wheeling Coal Co., and Costanzo Coal Mining Co., asks for the return of the coal properties held under lease by the Warner Coal Company, a bankrupt.

The petition seeks return of all of the properties now being operated by A. Spates Brady, receiver.

The action followed decisions of the U. S. Supreme Court and the U. S. Circuit Court of Appeals for the fourth circuit which affirmed the action of Judge Baker in declaring the Warner Coal Co. bankrupt.

Attorneys signing the petition for the return of the property were George A. Blackford and Austin V. Wood.

Richard Mine Sold

Industrial Collieries Corporation, a Bethlehem Steel Company subsidiary, is reported to have sold its Richard mine near Morgantown, W. Va., to the Consolidation Coal Company. Industrial Collieries operated the mine as a captive. About 2,000 acres of coal land and a model community of about 50 houses were said to be included in the deal.

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Coal Production

Production records of all kinds were broken in Alabama during 1944. In the matter of coal mining, records showed an increase of 2,000,000 tons, or approximately 12 percent, over that of 1943. It is the opinion of a veteran official of the De-Bardeleben Coal Corp., one of the largest in the state, that conditions will remain stable for the remainder of the winter. However, there is a need for approximately 2,500 additional workers in the mines of the Birmingham district.

Steel Increase

In the matter of steel production for 1944, there was a substantial increase all along the line. The Tennessee Coal, Iron and R.R. Co. reports a 10 percent increase in strip mill production, 8 percent in open hearth and steel foundry, and 25 percent in shell forging.

Another item produced by the T. C. I. Company, is ground basic slag, for soil conditioning, and its manufacture shows more than 12 percent increase in 1944 over that of 1943. Their by-product plant coke production topped the all-time high record of 1942 by 22 percent.

Praco Plant

The new tipple and coal preparation plant of the Alabama By-Products Corp., located at Praco, 30 miles west of Birmingham, now in operation, is the largest and most modern of its kind in the state. Its capacity is 6,000 tons daily, with the finished product being of high quality and uniform grade, usable for coking, railroad fuel and general purposes.

Kentucky Mining Institute Meets

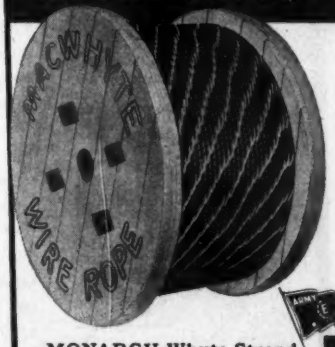
A number of very fine coal mining papers were presented at the annual meeting of the Kentucky Mining Institute at Lexington December 8 and 9. M. K. Reed, operating engineer, Turner Elkhorn Mining Co., Drift, Ky., described operations at the Turner No. 3 mine of the Sizemore Mining Company which enjoys an average output of 20 tons per man at the face in 42-in. coal. The mine is completely mechanized and utilizes drives mounted on wheels with pneumatic tires in its complete conveyor operations. Lindsay Cobb, assistant general superintendent, Norton Coal Corp., Nortonville, Ky., described the use of prefabricated tracks in a three-room key system of haulage with track-mounted loading machines at East Opening No. 2. Tied to a track system because soft bottom eliminated rubber-tired haulage, the system calls for complete interchangeability of all turnout parts except stock rails. Steel ties are used throughout and faces are driven to fit the track almost exactly. Mr. Cobb reported excellent results with this system with a single machine averaging some 480 tons per shift in 6 ft. coal, in conjunction with 8-ton cars.

F. W. Gusweiler, program head, War Manpower Commission, Cincinnati, spoke on "Do We Expect Too Much of Our Supervisors?" He told of the urgent need for training of supervisors and pointed out the tools that are available in his work. H. S. Homan, secretary, the Elkhorn Operators Association, noted the endorsement of such programs by the operators, and John T. Parker, superintendent, Midland Steel Co., at Wheelwright, noted that all officials in his organization had taken the job instruction and job relations training with notable improvement in the organization. George Tarleton, general superintendent, Consolidation Coal Co., at Jenkins, noted that the job training program is helpful in ironing out grievances in their early stages. J. J. Foster, assistant to the vice president, Island Creek Coal Co., in his paper "Mine Management," praised "Training Within Industry" programs and emphasized the importance of the thought that to the workmen the foreman is the company.

Alex U. Miller, U. S. Bureau of Mines, Mt. Hope, W. Va., spoke on "The Value of Barricades for Saving Lives During Mine Fires and After Explosions." Reviewing the data on mine disasters in this country, he noted the saving of 876 lives by barricades in the 42 disasters between 1909 and 1939. In this same period, 143 lives were lost behind barricades. Harry M. Roeser, manager, sales and service, Streeter-Amet Co., Chicago, discussed many of the practical details of scale use and operation and traced the sources of discrepancies which sometimes occur between tipple and railroad weights. This latter shortage is between ½ and ¾ percent, and inadequate tare weights are responsible for many of the cases of larger shortages.

Henry A. Spaulding, mining engineer of Hazard, demonstrated the principles involved and the requirements for taxation in a paper on valuation of coal properties. G. Moss Patterson, chief, department of mines and minerals, discussed mine fires and explosions in Kentucky in 1944. In one fire he noted that the synthetic rubber cover on cables had burned for considerable distances. Comments from the floor indicated the desirability of keeping such cables in good repair, including vulcanizing the joints and damaged places as soon as possible.

The CORRECT rope for your mining equipment



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Central States

Mining Improvement Reviewed

S. S. Clark, general superintendent of mines, Eagle Picher Mining and Smelting Company, in reviewing innovations in the mining methods in the Tri-State district, recently noted that equipment and methods which might have been declared foolish ten years ago are now readily accepted because of the serious labor shortage in the mines. The miners themselves fully realize that the rapid reduction of reserves would soon put them out of a job if means were not at hand to work the lower-grade deposits. The new machinery is looked at not so much as a labor-saving device as a means of "job and community saving."

He noted that the introduction of truck haulage underground permitted the quick opening of old mines and obviated such delays as are usually experienced in waiting for rails and for material from which to construct hoisting cans. He predicted still further improvement in this type of haulage through the adoption of ideas obtained from coal-mining operations.

The most recent idea to play a big part in maintaining production in the face of labor shortage is the caterpillar drill carriage or "Jumbo." Improvements have been made in this carriage to permit the use of 11-ft. drill steel with an air-motor driven feed chain now being employed instead of the conventional screw feed. Maneuverability of the carrier is high as it can negotiate steep inclines and readily works its way up towards the working face of headings otherwise difficult to reach. The machine has a small winch which manipulates the drill machine carrying arms or posts into operating positions. The device not only reduces fatigue of machine man and helper in setting up, dismantling and moving, but functions as a time saver to double the work per man shift.

Mr. Clark also expects considerable activity in the removal of old pillars in the final exhaustion stages of the mines. His observations on proposed "panzer" units are most interesting. The unit would consist of a drill carriage mounted in jumbo fashion on a truck chassis which also carries a small air compressor. A rubber-tired slusher slide to take a 30-in. or 36-in. scraper, loading into a battery-powered dump truck would be available so that the truck could deliver its load to some convenient point on the main haulage line. The combined unit would be manned by one crew and would be highly flexible as it would be employed in final cleanup of ore patches, the work of which would be rather scattered so that speed and ease of operation would become highly essential.

Increased Barites Output

Baroid Sales Division of the National Lead Company and the Magnet Cove Barium Corporation are reported to be producing some 15,000 tons per month of ground barite which is going to the drilling-mud departments of the oil well industry. The source is the Magnet Cove barites deposits in Hot Springs County. Additional production is expected when enlargement of facilities now under way have been completed. A diamond drilling project by the Bureau of Mines is under way in the region to determine the possible locations of other barites deposits in favorable geological areas adjacent to Magnet Cove.

Indications of a large deposit of good grade barites are given in the report of a discovery in southern Montgomery County near Caddo Gap. The ground is under lease to the Baroid Sales Division of National Lead Company and a systematic trenching and sampling program to determine the commercial possibilities of the deposit is being conducted by the company's geologists.

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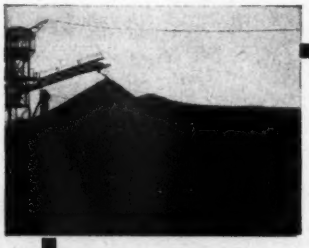

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North Arkansas Zinc Operations

S. & G., Inc., recently shipped two carloads of high-grade carbonate concentrates from operations at the Big Hurricane mine. J. C. Shepherd and Tom Grimmett of Harrison, Ark., are the operators. It is reported that mill operating difficulties, characteristic of new mills, have been largely overcome and the plant now enjoys rather steady operation. It is believed that production will show an increase in the near future as the drilling operations have disclosed more ore than the original estimates indicated.

The Moark Mining Company, which operates several small properties in the area, is reported to have discontinued its ground operations. Its milling plant is now being operated by James Rogers, who operates the Coon Hollow mine.

New Name for Mine Group

The M. A. Hanna Company, which recently acquired the Evergreen mine with its sinter and ore treatment plants at Crosby, on the Cuyuna iron range, Minnesota, is making repairs to the sintering plant, rebuilding the ore washing plant and making other changes. The three properties, formerly known as Portsmouth, Evergreen and Wearne, now have the single group name of Portsmouth. It is reported that all pit production in 1945 will be by truck operation and that developments are under way for a new pit belt conveyor and crusher to be operated in 1946.

Drilling in Cook County

An agreement has been reached between the Minnesota Iron Range Resources and Rehabilitation Commission and the Board of Regents of the University of Minnesota to proceed with the diamond drilling of known mineral areas in Cook County. The project will be under the direction of the Minnesota Geological Survey of which Dr. F. F. Grout is head and the Minnesota Institute of Research, a University organization. $25,000 will be provided by the commission for the diamond drilling and reports will be made of findings and estimates of reserves revealed. The area chosen for the new drilling campaign is reported to have large outcrops of magnetic iron ore.

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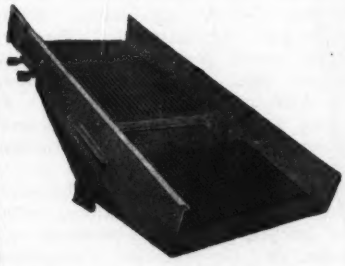

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DANVILLE, ILLINOIS

C & H Expansion

Calumet and Hecla Consolidated is engaged in numerous activities indicating a general trend toward expansion. A new department has been formed to purchase and treat scrap copper-bearing materials to be known as the secondary department. Scrap will be purchased in the market for treatment at Torch Lake.

Drifting on the 41st level of the Centennial mine on the north side of the shaft has reached some 1,300 ft. through good-looking ground. The last drifting was about 13 years ago. Drifting is also contemplated on the south side.

The company has put a retirement income plan into practice to cover salaries of employes earning more than $3,000 per year.

Book Mine Operations

The Book mine of the North Range Mining Company at Crystal Falls, Mich., is reported to have completed its final open-pit operations. The shovel and trucks have been shipped to the Schley mine at Gilbert, Minn., where they will be employed in winter stripping work. Operations at the Book mine in the future will be by underground methods with the ore to be hoisted by two 4-ton skips hoisting in balance on a 25 deg. incline. The mine has developed considerable percentages of jig ore.

Carey Mine Progress

The shaft of the Carey Mine No. 2, recently sunk by the Newsom process, has been enlarged to full size for 300 ft., with all steel sets in this portion aligned and anchored. The new headframe has been completed and the Nordberg electric hoist is in operation; the Sullivan 3,600 c.f.m. air compressor has been installed. The mine is located at Hurley, Wis., and is operated by Pickands, Mather & Co. Rock in the shaft is broken down by blasting and removed from the bottom of the borehole on the bottom level.

Wheels

(*Continued from page 125*)

Other participants were Representatives Brent Spence and Jesse T. Wolcott, chairman and ranking minority member, respectively, of the House Committee on Banking and Currency, Economic Stabilization Director Fred M. Vinson, Assistant Secretary of State Dean Acheson and Assistant Secretary of the Treasury Harry White.

Very recently the American Bankers Association has come forward with a statement endorsing the Bretton Woods objectives but counseling against the dangers of either overlending or lending not enough. Stating their intention to give full cooperation to whatever stabilization and international banking mechanisms are finally adopted, the ABA still believes that its proposal would be acceptable to the other 43 Nations who are parties to the agreement made last summer.

The Bankers' proposal would repeal the Johnson Act, which prohibits the making of loans to foreign nations which defaulted on their previous debt to the United States, and would enlarge the lending powers of the Export-Import Bank. An International Reconstruction Bank would be created, empowered to arrange stabilization agreements between countries which are participants and to remove restrictions in the form of exchange controls as soon as practicable. The ABA would provide a total payment of $3,175,000,000 to the International Reconstruction Bank for lending and stabilization purposes, instead of the Bretton Woods plan to furnish $5,175,000,000 for the bank and the stabilization fund. The bankers would strike out the $8,800,000,000 international monetary fund contemplated in the Bretton Woods agreement. While present Administration - Treasury plans would increase the Export-Import Bank capacity to $5 billion the ABA plan would authorize a $2 billion fund with which the Export-Import Bank could conduct its foreign loan activities.

As a means of placing bankers' spokesmen in the international banking picture ABA recommends an American Government Committee made up of the chairman of the Federal Reserve Board and officials of the State, Treasury and Commerce Departments, Foreign Economic Administration and the Export-Import Bank.

Informal and Quasi Contracts

Recent issuance of regulations by two agencies, the Office of Contract Settlements and the Reconstruction Finance Corporation, has again drawn attention to the possible filing of claims by metal and mineral producers under Section 17 of the War Contracts Termination Act approved in the spring of 1944. Section 17 of that Act has to do with defective, informal, and quasi contracts, involving cases where war materials, services or facilities have been furnished without a formal contract. Section 3(g) of the Contract Termination Act includes the War Production Board as well as the RFC and its subsidiaries within the designation of "contracting agencies."

Regulation No. 1 of the Reconstruction Finance Corporation and No. 12 of the Office of Contract Settlements outline the procedure to be followed by war contractors and claimants in much detail.

Potash Leasing Regulations

Startling to mining men generally, to present holders of potash leases and to prospective applicants for permits to explore for potash deposits are the recently published Department of Interior Regulations governing potash exploration permits and leasing. Under the provisions of these Regulations it is regarded as extremely doubtful that anyone would expend money, or could secure money to expend, in exploration for potash deposits which, when, and if found and leased would be subject to the restrictions specified.

Some of the features of the regulations are: (1) no lessee may now hold more than six leases aggregating 15,360 acres and permits for exploration are limited to six, whereas they were previously unlimited; (2) the holder of exploration permits may secure an extension only if he has drilled at least one adequate test well during the two-year period for which the permits were granted; and (3) in addition to requiring royalty payments in potash instead of cash to the Federal government, if so directed, the Government reserves the right to purchase, after one year's notice of intention to do so, "up to one-fourth of the quantity of potassium produced from the leased land, at the point of shipment to market, at not more than prevailing wholesale price f.o.b. refinery as determined by the Secretary of the Interior."

The limitation on exploration permits and leasing acreage are definite handicaps to the justifying of capital expenditures and the financing of potash operations. The requirement that at least one "adequate" test will be completed on *each* permit in order to secure an extension is an embarrassment particularly to any small operator. These lease provisions under which the Government may take up to one-fourth of the quantity of potassium produced plus the royalty payment in potash, not only tend to close the door to the financing of future developments but also must necessarily be a matter of real concern to present operating lease holders who have made very large expenditures in plants and equipment and who will naturally expect to have their leases renewed.

Western States

Idarado Mill Goes to Work

Idarado Mining Company's Treasury Tunnel mill recently underwent a single shift test to try out new machinery which will have a capacity of 300 tons when things are running smoothly. Interesting feature of the new mill is the three complete separations it will make. For each 100 tons of ore milled, 4 tons of lead concentrates, 5 tons of copper concentrates, and 8 tons of zinc concentrates are expected to be shipped.

It is reported that the new mill will be one of the major operations of the Newmont Mining Corporation of New York, with greater milling capacity in view as the demands increase. There are now more than 100 men on the payroll and this number will be increased as rapidly as developments permit carrying new miners and other laborers. The work of driving along the Black Bear vein on the Ouray side is being pushed with an excellent showing of ore and the raise that has been started is well on its way toward the old Black Bear workings to open up another large reserve of ore.

Investigate Waelz Plant

The Ore and Chemical Corporation is interested in an effort to establish a Waelz kiln in the Leadville area to treat the large reserves of low grade zinc carbonate in the district. The Leadville drainage tunnel is also expected to open up large deposits of this material.

Maid of Erin Production

The John Hamm Mining and Milling, Ltd., produced over 25,000 tons of zinc, lead and copper concentrates in 1944, according to reports. Ores were processed from the Maid of Erin and Wolftone dumps to produce this tonnage of concentrates, most of which were shipped to the selective flotation mill of the Golden Cycle Corporation of Colorado Springs.

This company enjoyed an especially high combination production per manshift which was in excess of 750 pounds of zinc, lead and copper for every manshift involved in the entire operation. This record is the source of considerable pride of the organization in its contribution to the war effort.

Pumping at Silver King

Deep well pumps have been installed at the Park City property of the Silver King Coalition Mines Company, following flooding of the western section of the mine, according to James Ivers, president.

The western end of the property was flooded when a blast opened a major water flow on the 1,950 ft. level where a new ore body was encountered. Since the pumps were installed the water has been lowered to the 1,900 ft. level and the water is going down at a rapid rate. No injuries occurred and equipment above the 1,900 has been recovered and placed in operation.

Park Utah Dividends

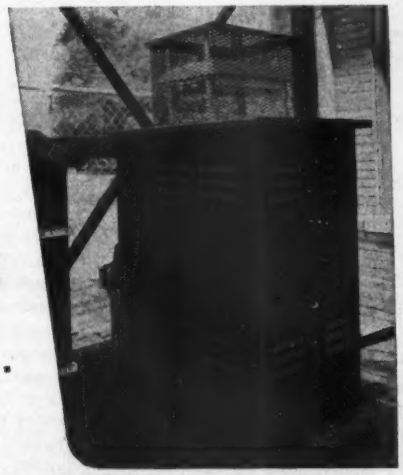
Directors of the Park Utah Consolidated Mines Company have declared a dividend of 10 cents per share, payable January 10, O. N. Friendly, vice president and general manager, announces.

The dividend amounts to $209,186.80 and is the first paid for 18 months.

Iron Mine Developments

Further development of the iron mines west of Cedar City, Utah, will be started immediately as a result of contracts signed recently by the Kaiser interests of California and the property owners.

Senter F. Walker, of Salt Lake City, who controls properties in the



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Representatives in Principal Mining Areas

area, announces that iron ore from the Excelsior deposit in the Iron Springs district will soon be going forward to the Kaiser plant at Fontana, Calif.

The contract calls for the shipment of 1,000,000 tons of ore to the coast plant. The Utah Construction Company has been engaged to handle the production. Equipment will cost approximately $300,000, and a spur railroad will be built to connect with the Union Pacific branch line from Cedar City to Lund.

Miller Leases Eagle Picher Properties

A 10-year lease and purchase option on the Montana, Ruby Lakes and all other lead-zinc properties of the Eagle Picher Mining and Smelting Company patented on 365 acres in the Oro Blanco district of Santa Cruz County in southern Arizona, has been taken by Hugo W. Miller, assayer and miner of Nogales. He will mine the lead carbonate ores near the surface, and join his new operations with those of the Miller-Hanson property, a western extension of the Montana mine, it is reported. The Eagle Picher Company operated the holdings for 8 years, until several months ago.

1944 Safety Record

Arizona's record of seven deaths in underground mine accidents for the year ending November 30, 1944, was the lowest since statehood, according to Nellie Foster, retiring state mine inspector in a report to Governor Sidney P. Osborn on January 1. Ten mine fatalities were reported for the year in which 6,802 men were employed under and above ground by Arizona mines. The greatest number of mine deaths on record was 93, in 1918.

New Non-Metallics Bulletin

A new bulletin summarizing past production and present operations of Arizona nonmetallics deposits has been issued by the Arizona Bureau of Mines. Geology of the deposits in the state is not treated but definitions of minerals, their chief commercial uses, general specifications, prices, and data of occurrence are included preliminary to more detailed reports to be issued by the bureau, it was said by Eldred D. Wilson, geologist and bulletin author.

Coronado Development Under Way

Major development of the Coronado mines, located near Nogales, on the Washington Camp road, is underway. The mining firm is headed by Milton Leon, Tulsa, Okla., whose associates are George B. Schwabe, Congressman-elect, and Dr. C. B. Kingery, both of Tulsa.

4,500 Men Needed

A WPB request that Arizona mines produce 35,000,000 lb. of copper in the first three months of 1945 necessitates an increase of 4,500 more men to work the mines, according to advice of E. L. Turkington, San Francisco, WPB regional management agent. A need of 1,700 on January 1, was evident, it was said.

Mining Association of Montana Meets

The sixth biennial convention of the Mining Association of Montana was held at the Placer Hotel, at Helena, January 17. Robert P. Porter, of Helena, president, Mikehorse Mining and Milling Co., succeeds John Hickey, president, Moorlight Mining Co., of Phillipsburg, as president of the association; W. R. Allen, of National Boston Montana Corp., of Wise River, is first vice president; K. D. Lynn, of the Boaz Mine of Norris, is second vice president; and Carl J. Trauerman, of Butte, has been re-elected secretary-treasurer. Dr. Francis A. Thomson, of Butte, and Mr. Hickey are members of the executive committee.

Prominent representatives of the state government, the mining industry and labor were present to listen to and take part in an open forum devoted to general mining questions. Speakers were W. H. Forbes, staff engineer of the Mining Section of the National Safety Council, Chicago; John L. Boardman, chairman, Bureau of Safety, Anaconda Copper Mining Co., Butte; and John A. Johnson, mining engineer in charge of the Butte office of the U. S. Bureau of Mines. Carl J. Trauerman reported on the work and progress of the organization in meeting the problems of the small mine operators of Montana.

The activities of the association in getting the Treasury to set aside the arbitrary ruling on deductions for depletion on producers of gold bullion for amalgamation and cyanidation were mentioned in connection with similar activities on the part of other western mining associations cooperating through the American Mining Congress. The association has also joined in maintaining the position of silver and in the campaign to obtain more meat for miners; has constantly urged that the shutdown gold mines be allowed to reopen, that they be allowed loans to take care of their maintenance and rehabilitation, and to sell their newly produced gold in the highest world markets. It has joined in efforts to clarify the land laws relative to mining claims, as well as to secure the enactment of a modified national service act to obtain miners; it has been especially active in a modification of state and Federal restrictions which now make it difficult to finance small mines and prospects through the sale of securities to the public.

At the legislative banquet during the evening, Governor Sam C. Ford declared "We have not taken full advantage of the possibilities for the development of Montana's resources. I hope that the next ten years will see that done more fully when you men get to your mines and help build a greater Montana."

The association resolutions committee presented resolutions asking for $50,000 annually for the State Bureau of Mines and Geology; asked for a committee to investigate means of reducing the rates of industrial accident insurance; endorsed Governor Ford's recommendation for advertising funds to bring Montana's opportunities before the nation and commended the Governor for his action in calling the recent small mines conference in Butte. The absence of Dr. Francis A. Thomson, who is at Mesa, Ariz., recovering from an illness, was a source of regret. A resolution was presented to instruct the secretary to wire him expressing the Montana Mining Association's wish for his speedy recovery.

New Machinery Installed

The Nevada - Massachusetts Company recently installed six electric locomotives and two mucking machines for underground ore haulage at its tungsten property in Mill City, Nev. The company is mechanizing its mining and milling operations as extensively as possible in an effort to combat the manpower situation.

The Mill City operation includes the mine, a 1,000-ton tailings plant and a 400-ton mill. The company is also equipped to mine and mill 100 tons of ore per day at its Golconda Division at Golconda.

Magnesium Castings Company Organized

It is reported from Las Vegas that the Magnesium Castings Company has been organized to start operations as soon as possible at Las Vegas. Four former Basic Magnesium, Inc., employes compose the company. They are Earl Magee, former X-ray and metallurgical technician at BMI; James H. Bradford, formerly director of laboratory processes; Harry Giffen, mining engineer, formerly in charge of sampling; and E. E. Jones, formerly metallurgist and technical service assistant. The new company is preparing the old Midway Casino building at the Pittman Camp for its immediate use and is planning a new structure to house its foundry.

Gold Mining Operations Still Await Cancellation of Order L-208

Limited production incidental to maintenance has been permitted the Original Sixteen-to-One Mine, Inc., since December 8, 1942, by WPB. Since that time the company has been maintaining a small crew at its property near Alleghany, Calif. The company also owns and operates the Tightner mine.

Only one man is being retained for the general upkeep at the German Bar Gold Mines, Inc., but the company plans to reopen the mine as soon as possible and has announced that an additional crusher and hoist will be installed for post-war operations. The property is located near North Bloomfield, Calif., and its workings include about 1,800 ft. of tunneling. A 30-ton flotation mill has been erected on the site.

The Midland Mining Company reports present plans call for resumption of operations after the war and all dragline dredging equipment has been maintained at the property, located on the North Fork of the Salmon River near Sawyers Bar, Siskiyou County. Formerly 2,000 cu. yds. of material was handled every 24 hours on a three-shift basis.

The Golden Feather Dredging Company, of which E. A. Wiltsee of San Francisco is general manager, reports that it is continuing production with 23 men employed. Its mine office is at Oroville, Calif., where it recently completed dredging of the Feather River under special permission of the War Production Board. It is now conducting operations in the Thermalito district.

Two men are being employed on maintenance at the El Conejo mine near Darwin, Calif., where the operators have a complete camp consisting of 11 buildings, and hoisting engine and compressor house. It is reported that the company plans soon to sink its 150 ft. shaft another 150 ft. The operators are said to hold a War Production permit to employ 5 men in the continuance of development work.

The Ruby, Gold Bluff and Oxford mines are said to be closed down with only maintenance work being done to keep the mines in condition for operation after the war. The Gold Bluff is in Sierra County near Downieville. The Ruby is a draft placer and quartz property, located at Goodyears Bar, with a 600-ton gravel concentration plant and a 10-stamp quartz mill on the property. The Oxford is next to the Gold Bluff on the North Fork of the Yuba River. This is a chrome property.

The above items are typical of numerous reports from gold mining operations in the West awaiting the cancellation of L-208.

This Shot-Firer and His Company Know . . .

That when it comes to tamping the best way—to increase his safety—to save his time—to keep fumes and smoke to a minimum—to increase their production and still decrease the amount of explosive required—is to use tamping BAGS—especially the original tamping bag—SEALTITE TAMPING BAGS.

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The cost of the bags and an unskilled man to fill them and keep shot-firers supplied at the face is more than offset by savings in time and powder and increased production.

It will pay you to ask for enough Free Samples for a test.

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Chester Vein Developments

Sunshine Mining Company has opened the Chester vein ore shoot on the 3,700-ft. level, 1,000 ft. below sea level, the deepest mining operation in the Coeur d'Alene district. This ore shoot on the 3,100-ft. level has been extensively developed and is the largest and richest body of ore found in the district for many years. The new development on the 3,700 level shows a full face of high grade milling ore in the drift heading. Temperatures on this level are reported very high, about 95 degrees.

Group Insurance Plan

The Sunshine Mining Company has adopted a group insurance plan covering all employes who have worked for the company for a period of one year prior to November 21, 1944, in the sum of $1,000. Employes who had worked less than one year on that date were insured for $500 each, subject to increase to $1,000 after one year's continuous service. New employes are eligible to the insurance after two months continuous service.

WLB Fixes Wages

The War Labor Board has fixed wages in the Coeur d'Alene mining district at $8.25 (eight-hour shift) for miners, $8.75 for drift miners, $8.75 for raise miners, $8.75 for timberman, $9 for timber repairman, $8.25 for mucking machine operator, $8.25 for trackman, and $9 for blacksmith. Shaft repair men are the highest paid workers in the mines at $9.25 per shift.

Manpower Relief!

War Production Board officials have recently visited the district to investigate the possibilities of increased lead and zinc production. They were advised by mine operators that production has been under normal since the war started on account of a shortage of manpower and if this condition is remedied, output of all the producing mines can be greatly increased. Relief was promised.

Highland-Surprise Has New Control

Controlling stock interest in the Highland-Surprise Mining Company on Pine Creek has been purchased by Frank Luedke, Benjamin H. Sheldon, and associates of Spokane from Dr. Charles R. Mowery, of Spokane; Dr. Herbert Mowery and Pete Huemann, of Wallace. The new owners also control the adjoining Nevada-Stewart property. The Highland-Surprise is equipped with a milling plant and is producing about 65 tons of ore per day. Last financial report of the company shows net profits of $107,658.45 for the year ended October 31, 1944.

Contract for Five-Mile Tramway

It is reported that the Northwest Magnesite Company recently awarded a contract for a 5-mile tramway to the Riblet Aerial Tramway Company, at Spokane, Wash. The new tram will run from the company's Keystone magnesite deposits 12 miles west of Valley, Wash., to the heavy media concentration and flotation plant at Brown's Lake, 5 miles west of Chewelah. Included in this contract are the tram terminals.

An additional contract was let by this company for an 8 ft. by 10 ft. tunnel to undercut the Keystone magnesite deposit and a third contract was let to the Colonial Construction Company in Spokane for stripping overburden.

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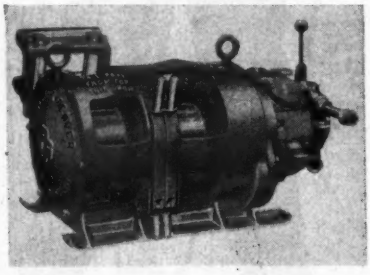
New Airslusher

Exceptional power is said to be combined with compact design in a new line of airslushers manufactured in three sizes by Gardner-Denver Company, of Quincy, Ill. The new airslushers are operated entirely by a single throttle lever. Operation is said to be such that an operator can move the lever with little effort. Throttle returns automatically to neutral when released.

Power can be applied at will to either drum by simply reversing the



air throttle. A simple roller clutch engages one drum and automatically releases the other when the throttle is reversed. Clutch is reported to never need adjustment and to be virtually indestructible.

The new airslusher has a five-cylinder radial air motor that develops maximum power and speed in either direction. The high torque air motor is claimed to assure bigger loads and the motor flexibility makes possible a faster return to the empty scraper.

The compact design and light weight of these airslushers is intended to make them more convenient for moving through small raises and chutes into inaccessible stopes. Throttle lever can be lowered to horizontal position for maximum compactness and to avoid accidental damage while moving.

Jeep-Mounted G-E Welders

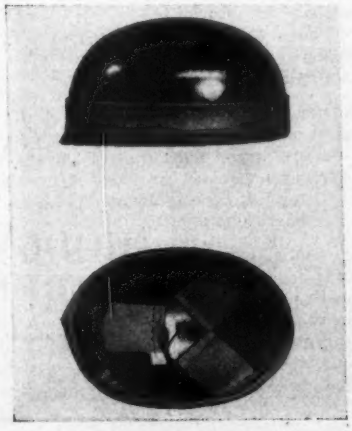
Modified General Electric arc welders mounted on standard quarter-ton Army jeeps are being used extensively by maintenance organizations dispatching contact parties in the combat areas. Because of their compactness and light weight, as well as their maneuverability over difficult terrain, these mobile units have also been adopted for jungle operations and are expected to be used for air-borne and amphibious operations.

Driven by a V-belt on a power take-off from the jeep's engine, the welders are bolted to the floor of the jeep in place of the right-hand front seat. They provide 40 to 250 amps. of current, and are capable of handling electrodes of various sizes up to and including those ¼-in. in diameter. The welders are ready for use as soon as the jeep is stopped. A governor, which is disengaged by a hand-operated clutch for normal operation of the vehicle, maintains the engine speed during the welding operation, while belt guards and heavy protective covers safeguard the personnel. When not in use the welders do not interfere with the customary use of the jeep, since the closed cover serves as a seat. A feature of these welders is that they are not dependent upon a parent organization for the resupply of oxygen and acetylene cylinders.

"Beanie" Caps

Portable Products Corporation, 420 Boulevard of the Allies, are now manufacturing a new type of head protector. Known as "Beanie" caps, they are made of molded fibre and employ a soft, flexible band which is reported to fit any shaped head comfortably. The cap lining and hammock are arranged so as to cushion the blow.

"Beanies" are extremely light-



weight, weighing approximately 6 ozs. They are said to be particularly valuable to garage mechanics working under an automobile, or to men who must enter and repair the firebox of a locomotive. Packing-house employes wear them to guard the head against moving meat hooks. In general, "Beanies" may be worn industrially where protection of the skull and scalp is paramount.

New Coal Cleaning Contracts

Roberts & Schaefer Co., Chicago, announces the following:

Knott Coal Corporation, Inc., Anco, Ky.—Hydro-separator coal washing equipment, for washing 2-in. by ¼-in. coal at the rate of 80 tons per hour; plant to be completed March 1, 1945.

Lillybrook Coal Company, Killarney, W. Va.—Stump air-flow coal cleaning equipment and accessories, for cleaning ⅜-in. by 0 middlings at the rate of 50 tons per hour; plant to be completed April 1, 1945.

Majestic Collieries Company, Majestic, Ky.—Stump air-flow coal washing equipment and accessories, for washing ⅜-in. by 1¼-in. coal at the rate of 125 tons per hour; plant to be completed May 1, 1945.

New Hydraulic Hose

The United States Rubber Company announced recently that it is producing a flexible hydraulic hose that sends out a stream of water powerful enough to rip the bark off a log.

Braided with wire and specially fabricated to withstand the high pressure, the hose is used in a de-barking machine which has stripped a 20-ft. log in 30 seconds.

Paper and pulp mills have reported a saving of 18 to 20 percent in pulp and 20 percent in manpower with the de-barking machine, developed by a Pacific coast pulp firm.

Two jets of water spurt from nozzles mounted on a mobile carriage, and the pressure is said to be so great that the nozzles must be kept moving constantly to prevent the water from boring a hole into the log.

Diamond Impregnated Reaming Shells

Reaming shells for use with diamond core bits are now being carried in stock available for immediate shipment in three standard types and four sizes by the Mining Division of the Carboloy Company, Inc., Detroit 32, Mich., producer of cemented carbides, carbide-tipped cutting tools, and core bits. These reaming shells are provided with a series of "Sinta-Set" diamond impregnated carbide inserts designed to increase core bit life.

The inserts—brazed into recesses around the periphery of the reaming shells—maintain gauge during the entire useful life of the bit. When the original bit is replaced, no further reaming in the drilled hole is required according to reports. Each insert is impregnated throughout one-half of its thickness with a quantity of highly selected West African bort.

Three or four inserts are mounted around each shell, according to the size of the reamer. As repeated use wears the inserts and thus reduces them in size, the reaming shell can easily be brought back to its proper diameter by heating the inserts with a torch until the braze metal has melted; removing the inserts; placing a shim of the proper thickness in the recess; and then re-brazing the inserts on top of the shims. Thus greater life can be obtained from the reaming shell since it can be used until the shell itself is worn so thin that it must be discarded. No dressing of the diamonds is required since the wearing action of drilling keeps fresh cutting faces of the bort constantly exposed.

Both single and double tube shells are offered. Three of the most commonly used types of reaming shells—Longyear, Sullivan, and Sprague and Henwood—are carried in stock, equipped with the "Sinta-Set" inserts. These standard shells will fit standard core drill fittings as listed in United States Department of Commerce Bulletin CS-17-32.

The four sizes offered from stock are:

EX, carrying 3 inserts.
AX, carrying 4 inserts.
BX, carrying 4 inserts.
NX, carrying 4 inserts.

Special types and sizes of reaming shells can be equipped with diamond impregnated carbide inserts, at a slight increase in cost over standard shells. For such special requirements, the user sends his own special reaming shells to Carboloy Company and has the finished product made up to suit his own specifications. "Sinta-Set" inserts may also be obtained unattached to shells, if desired.

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Plastic Armored Drill

A new development of Thor "Armored in Plastic" portable electric drills that introduces a side handle type machine said to be 20 percent lighter than comparably rated drills with aluminum casings has been announced by Independent Pneumatic Tool Company, of Chicago.

The new side handle type Thor drills are identical in construction to the original "Armored in Plastic" pistol grip machines, except for the side handle. The gear case, field case and handle are molded in the specially-developed "Thorite" plastic which is said to have surpassed performances of heavier metal housings for durability and cool, easy handling on every type of heavy production and maintenance jobs.

All internal operating parts are supported in a metal frame entirely separate of the plastic housings—an independent unit so constructed that the tool will operate perfectly with all housings detached.

The new Thor "Armored in Plastic" side handle drills are available in three speeds, 2,500 r.p.m., 3,750 r.p.m., and 5,000 r.p.m., weigh 3½ lb. and are 7 9/16-in. in length. Complete information and prices may be obtained by writing for Bulletin No. E-806, Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6, Ill.

Salute to Industry

For the second consecutive year Allis-Chalmers Mfg. Co. is honoring the men and women of one American industry each month as an intermission feature on their Saturday night broadcasts of the famous Boston Symphony Orchestra.

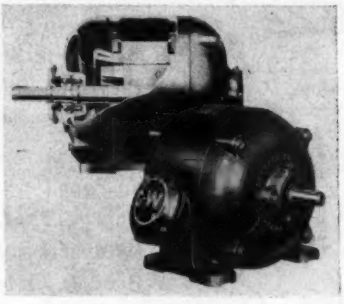
On January 27 management and labor of the coal industry received the first tribute in the new series of seven salutes. Other industries scheduled for the 1945 broadcast season are marine, railroad, processed foods, textile, automotive, and aircraft.

New Protected Type Motor Has Open Motor Capacity

A new motor, said to combine the surplus capacity of the conventional open motor with protection against dripping liquid, falling metal chips and other foreign matter, has been developed by the Crocker-Wheeler Division of Joshua Hendy Iron Works at Ampere, N. J.

Rated 40° C rise, full-loaded continuous duty, with a 15 percent service factor, protected-type motors are reported to provide added protection at open motor prices. At present, these motors are available in sizes up to and including the 284 frame. Mounting dimensions conform to the standards of the National Electrical Manufacturers Association.

There are no openings in the frame



or shields above the horizontal center line. This, together with the shielded construction of the ventilating openings, makes protected-type motors suitable for machine tool and similar applications where other types of enclosures have been required in the past.

Centrifugal seals permit use of softer grease for better lubrication and longer bearing life. The company's ALUCAST rotor construction, in which the bars, fans and end rings are cast in one operation from aluminum alloys, is employed.

Other features include: heavy cast frame construction, coils protected by Vinyl Acetal insulation, interchangeable front and rear shields, and specially designed guides for directing cooling air over all surfaces.

New Rubber Ingredient

Announcement is made of a new compounding ingredient by the Goodyear Tire & Rubber Company, Akron, Ohio, which expands synthetic rubber's range of usefulness to a host of products formerly confined to natural rubber.

One result of the new development, it is said, is to increase the availability of the nation's natural rubber stockpile to products for which synthetic rubber is still unfitted. It also enables production of items heretofore considered impossible with synthetic rubber.

It is emphasized, however, that the new ingredient—a resin obtained from a special type of synthetic rubber—has no bearing on the tire situation. Rubber compounded with this ingredient is generally unsuited for tires.

This synthetic rubber resin is reported to impart rigidity to synthetic rubber itself in direct proportion to the amounts used in compounding. This is important for wire and cable insulation, safety helmets, golf-ball covers and similar products where an extremely rigid, light-weight, impact-resistant product is desired.

Replacing carbon black, heretofore considered solely feasible for synthetic rubber compounding, the new resin permits production of synthetic rubber products where colors are desired, as in household and decorative items, toys and kitchen equipment, and where high resistance to electrical currents is required.

The new resin is being produced in three grades, designated as Pliolite S-1, S-2, and S-3. It eliminates use of carbon black entirely as a reinforcing agent in certain compounds. Carbon black, even when compounded with rubber, is a conductor of electricity.

Announcements

Walter Motor Truck Co., Ridgewood, Queens, L. I., N. Y., announces the appointment of George R. Morgan as factory representative for Walter snow fighters and Walter tractor trucks in Minnesota, Iowa, Illinois, North Dakota, South Dakota, Michigan and Ohio. He has established headquarters at 2647 Queen Avenue, N., Minneapolis, Minn.

* * *

The Myers-Whaley Company, Knoxville, Tenn., and **Wm. Neill & Son, Limited**, St. Helen's Junction, Lancashire, England, have concluded an arrangement by which Wm. Neill & Son are licensed to manufacture in Great Britain, and to sell in Great Britain and Europe, the "Myers-Whaley Shoveling Machines" and the "Whaley Automat Shoveling and Loading Machines" and will have the full cooperation of the Myers-Whaley Company in the production and application of these machines in Great Britain and Europe.

* * *

Roberts and Schaefer Co., Chicago, Ill., announces that L. A. Updegraff has been appointed sales and service engineer for the West Virginia, Virginia and eastern Kentucky coal fields, with headquarters at 2116 Washington Street, Bluefield, W. Va.

Mr. Updegraff will be available for service to coal companies in the district relating to the preparation and cleaning problems involving either wet or dry processes.

* * *

Cummins Engine Company, Inc., Columbus, Ind., has announced the appointment of F. W. Sparks as manager of the Cleveland region, with headquarters at 805 Fidelity Building, Cleveland 14, Ohio. This region includes Ohio and Michigan.

* * *

Link-Belt Company announce removal of the Huntington, W. Va., office from 2840 N. Staunton Road to Suite 1301-1302 in the West Virginia Building, corner of Fourth Avenue and Ninth Street, postal zone 9.

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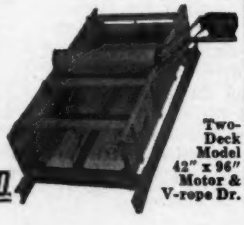

Two-Deck Model 42" x 96" Motor & V-rope Dr.

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